NOTE

The Model RTH-B18B RF Tuning Unit is a modified version of the Model RTH-B18 RF Tuning Unit. Information pertaining to this modification is given in Section IX of this manual.

INSTRUCTION MANUAL

MODEL RTH-B18B RF TUNING UNIT

designed for use with the
Model TMR-18B Telemetry Receiver

23 February 1966

Defense Electronics, Inc.
Rockville, Maryland

INSTRUCTION MANUAL

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MODEL RTH-B18
RF TUNING UNIT

designed for use with the

TMR-18 TELEMETRY RECEIVER

DEI *Defense Electronics, Inc.*
RESEARCH ■ DEVELOPMENT ■ MANUFACTURING
ROCKVILLE, MARYLAND

19 January 1966

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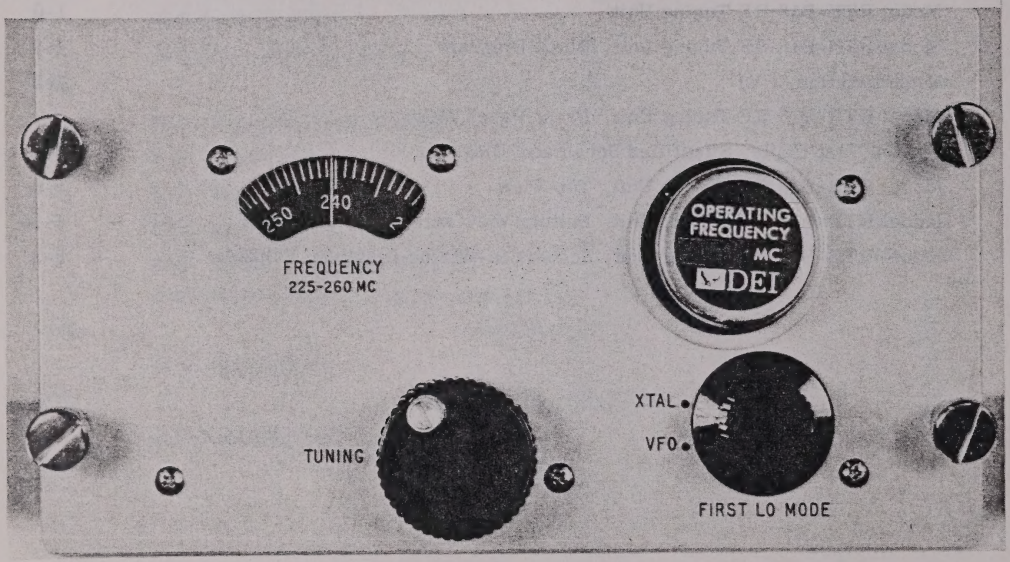


Figure 1-1. Model RTH-B18 RF Tuning Unit

SECTION I
GENERAL DESCRIPTION

1-1 INTRODUCTION

The Model RTH-B18 RF Tuning Unit is designed for use with the Model TMR-18 Telemetry Receiver to meet the highest performance needs of specialized telemetry applications throughout the frequency spectrum of 225 mc to 260 mc. Noise figures of less than seven db are obtained over the entire tuning range of 225-260 megacycles.

The tuning unit functions as the rf amplifier, the first local oscillator, the first mixer, and the 30-mc preamplifier for the Model TMR-18 Telemetry Receiver. The unit converts the received signal to a 30-mc first intermediate frequency which is coupled to the 30-mc i-f amplifier in the TMR-18 receiver. Automatic gain control signals from the receiver are fed to the rf amplifier and the i-f amplifier.

Frequency selection is accomplished with either a tunable oscillator or a crystal-controlled oscillator as the source of the first local oscillator signal. Selection of the mode of operation, vfo or crystal-controlled, is made by a switch on the front panel of the tuning unit. The tuning mechanism is low-torque and virtually free of backlash.

The RTH-B18 is in the form of a complete plug-in module which may be installed in the receiver and removed from the receiver in a matter of seconds. All power and signal connections are made automatically by Blue Ribbon and coaxial connectors, respectively, as the unit is inserted into the receiver's main chassis; there are no cables to connect or disconnect when installing or removing the tuning unit.

1-2 ELECTRICAL AND PHYSICAL CHARACTERISTICS

The electrical and physical specifications for the RTH-B18 are listed in table 1-1. A simplified block diagram showing the main components comprising the unit is presented in figure 1-2. A tube and transistor complement list is given in table 1-2.

TABLE 1-1. ELECTRICAL AND PHYSICAL SPECIFICATIONS

Frequency Range	225-260 megacycles, continuously tunable or crystal controlled.
RF Bandwidth	overall 3 db bandwidth of rf tuning unit is 1.1 mc ±10%.
Adjacent Channel Rejection	output signal-to-noise ratio is degraded by less than 20 db due to presence of an adjacent channel signal (within the tuning range) having an input level of -13 dbm.
Intermediate Frequency	30 megacycles.
Local Oscillator Characteristics: Modes of Operation	a. crystal-controlled, using CR-32A/U crystal in oven; stability ±0.001%. b. continuously tunable; stability 0.001% per degree centigrade.
Input Impedance	operates from 50 ohm source.
Noise Figure	7 db maximum.
Image Rejection	60 db minimum.
IF Rejection	80 db minimum.

TABLE 1-2. TUBE AND TRANSISTOR COMPLEMENT

Reference Designation	Type	Function
V1	8203	Cascode RF Amplifier
V2	8058	
V3	7587	Mixer
V4	7587	IF Amplifier
Q1	2N3291	VFO
Q2	2N3291	Buffer
Q3	2N3478	Crystal Oscillator
Q4	2N3478	
Q5	2N3291	Buffer
Q6	2N3478	Doubler/Tripler
Q7	2N3291	Doubler
Q8	2N3291	IF Buffer

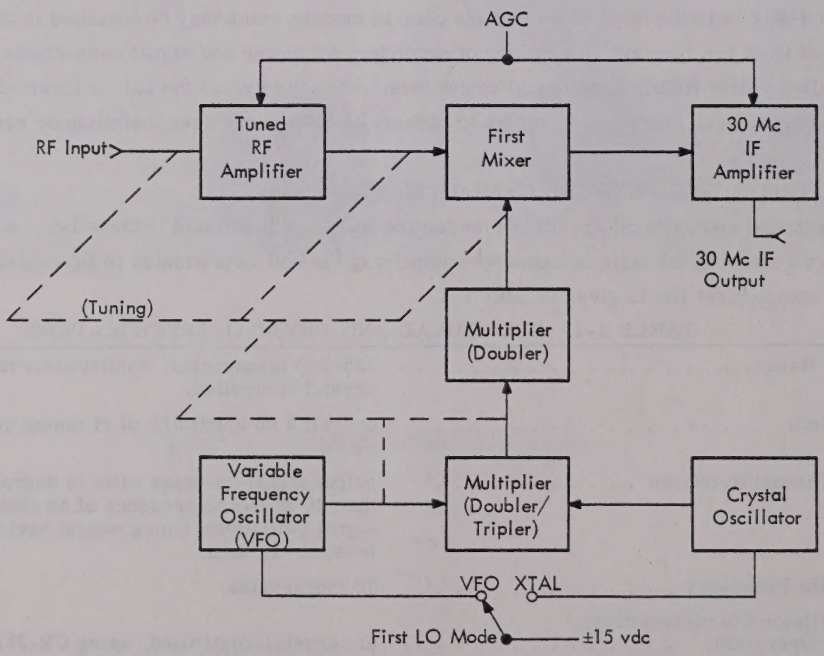


Figure 1-2. Model RTH-B18 RF Tuning Unit, Block Diagram

SECTION II
THEORY OF OPERATION

2-1 GENERAL

The Model RTH-B18 Tuning Unit is designed for use with the Model TMR-18 Telemetry Receiver to meet the highest performance needs of specialized telemetry applications. The RTH-B18 is in the form of a complete plug-in module which may be removed from or installed in the TMR-18 receiver. All receiver "front-end" circuitry from the rf amplifier to and including the i-f buffer is contained in the tuning unit which provides an output signal of 30 megacycles. A block diagram of the tuning unit is shown in figure 1-2.

2-2 CIRCUIT DESCRIPTION

2-2.1 RF Amplifier. The input rf signal is applied through a double-tuned circuit which employs an especially designed seven-section inductuner as the tuning elements for the rf amplifier and the local oscillator-multiplier chain.

The rf amplifier consists of V1 and V2, types 8203 and 8058 nuvistor triodes respectively, arranged in a cascode circuit configuration. The cascode amplifier is ideally suited for this purpose because of its inherent low-noise characteristics. The use of a double-tuned input circuit provides additional selectivity ahead of the rf amplifier. An additional advantage of the cascode is that it can be easily gain-controlled, thus providing a considerable increase in the signal-handling capability of the receiver.

The input circuit is double-tuned, primarily for better selectivity. The primary (L25A) provides the required 50 ohm input impedance and, in conjunction with the secondary (L25B), transforms the 50 ohm source impedance up to the higher impedance required by V1 for noise-figure considerations. Capacitive top-coupling is used between the primary and secondary of L25A and L25B.

The first section of the cascode is neutralized by means of a capacitance bridge, as shown in figure 2-1. C14 is the variable element which enables the bridge to be balanced, thus obtaining the desired relationship:

$$\frac{Ca}{Cd} = \frac{Cb}{Ce}$$

Agc voltage from the receiver is applied through R2 to the grid of V1. Coupling between V1 and V2 occurs through L26 and C19. L26 provides impedance matching between V1 and V2 and tends to equalize gain and noise figure across the tuning range. The rf signal from V2 is coupled through L25C and L25D, which provides double-tuned, fairly tight coupling to the mixer, V3. The other input to the mixer is generated by the first local oscillator and applied through a multiplier chain.

2-2.2 First Local Oscillator. The first local oscillator consists of a variable frequency oscillator, a crystal controlled oscillator, and appropriate buffer stages.

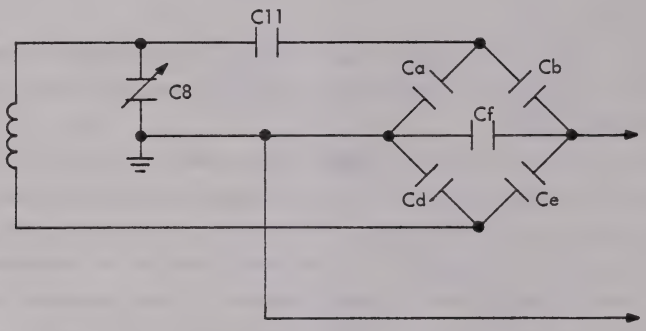
2-2.2.1 Crystal Oscillator. Q3 and Q4 constitute the broadband rc-coupled Butler oscillator which functions as the crystal oscillator. A two-section rc feedback path (C44, R39, C45, and the input impedance of Q4) exists between the output of the oscillator (Q3) and the base of the emitter-follower amplifier (Q4). The purpose of this is to prevent the third-overtone crystal from operating at the fundamental frequency; the time constant is selected so that feedback is not of the proper

phase for oscillation to occur at the fundamental. The feedback loop is completed from the emitter of Q4, through the crystal, to the emitter of Q3.

Output from the crystal oscillator is applied through C46 to the base of buffer Q5, thence from the collector of Q5 across broadband transformer T1.

The crystal oscillator functions only when S1 is in the XTAL position.

2-2.2.2 Variable Frequency Oscillator (VFO). The vfo comprises a 2N3291 transistor, Q1, in a Colpitts arrangement. The tuned circuit of Q1 is fairly-lightly coupled to the oscillator, and is very-lightly coupled to the vfo buffer, Q2. Light coupling is used to provide improved stability. The vfo functions only when S1 is in the VFO position.



Ca = input capacity of V1

Cb = grid-to-plate capacity of V1

Cd = C14 + C15

Ce = C13

Cf = output capacity of V1

Figure 2-1. Neutralization of V1

NOTE

The crystal oscillator and the vfo oscillator buffers are in the circuit at all times in order to maintain a constant capacity across the primary of T1. However, since operating voltage is applied to only one oscillator at a time, depending upon the position of S1, a signal will appear at the output of only one buffer.

2-2.3 Multiplier Chain. Q6 functions as a doubler/tripler; it doubles the frequency of the vfo signal, but triples that of the crystal oscillator. The crystal oscillator oscillates at one sixth of the injection frequency, and the vfo operates at one fourth of the injection frequency. The tuned circuit in the collector of Q6 is tuned to a frequency of one-half of the received frequency plus 30 mc so that Q6 doubles the vfo signal or triples the crystal oscillator signal.

The signal from Q6 is coupled to the base of Q7, the doubler, by C57, and the resulting l-o signal from the tuned circuit in the collector of Q7 is coupled through C31 to the grid of the mixer, V3.

2-2.4 Mixer and IF Amplifier. Both the signal from the rf amplifier and that from the multiplier chain are coupled to the grid (pin 4) of the mixer, V3. The output circuit of the mixer presents a low impedance to the incoming and l-o signals, but a high impedance to the difference frequency. The incoming and l-o signals are shunted to ground by C61, while the difference (intermediate) frequency appears across T2A. Top coupling is used to couple the signal to T2B. The i-f signal is reduced in amplitude by a factor of approximately three before reaching the grid of V4, by the voltage divider consisting of C70, C71, and C72. The signal is then coupled to the grid of V4 by C72.

Agc voltage from the receiver is applied to the grid of V4 through R16 and R58. An agc adjustment controlled by R58, allows standarization of the rf tuning unit gain such that maximum input signal contains the desired level of 30 mc i-f output to meet interface compatibility requirements between the tuner and circuitry located in the main chassis.

The cathode of the i-f amplifier is partially unbypassed to compensate for changes in the input capacity of V4 with G_m changes, thus contributing to stability of the stage under varying signal conditions.

To "stretch" the G_m curve of V4 (the 7587 tends to be a rather sharp-cutoff tube) the screen grid is floating for dc considerations, thus screen grid voltage increases significantly with increases in agc voltage.

The 30-mc i-f signal is coupled to the i-f buffer, Q8, by T3. Top coupling is again used.

2-2.5 IF Buffer. A type 2N3291 transistor is used as the i-f buffer, Q8. The purpose of Q8 is to provide the required source impedance for interface purposes.

The signal applied to the base of Q8 is obtained from a capacitance tap on the secondary of T3. Q8 is an emitter follower, the source impedance of which (R27 and output-impedance of the transistor) is selected to be approximately 50 ohms.

2-2.6 Power Supplies. Filament voltages for V1 through V4, and operating voltages for the transistors (+15v and -15v), are supplied from the receiver main-chassis through P2.

B+ voltages for V1 through V4, and screen grid voltages for V3 and V4 are also supplied by the receiver. Two voltages, one of 100 vdc and one of 150 vdc, are made available through connector P2 from the main chassis.

SECTION III
OPERATION

3-1 INTRODUCTION

A detailed operating procedure for a functioning TMR-18 receiver with rf tuning unit installed is given in the instruction manual for the Model TMR-18 Telemetry Receiver. For this reason only a brief description of operating controls of the Model RTH-B18 RF Tuning Unit will be given in this instruction manual.

The tuning unit is designed for use with either a type MIL CR-52A/U or a type MIL CR-32A/U crystal in a crystal oven, should crystal-controlled first local oscillator operation be required. Provision has been made for front-panel mounting of the crystal and oven. Crystal frequency is determined by the following formula:

$$fc = \frac{fr + 30}{6}$$

where: fc = crystal frequency
fr = signal frequency

3-2 CONTROLS

There are only two front panel controls on the Model RTH-B18 RF Tuning Unit. These controls and the function of each are as follows:

a. TUNING. This control permits the operator to manually tune the rf amplifier, the multiplier chain, and the first local oscillator during VFO operation. The TUNING control, also, permits manual tuning of the rf amplifier during XTAL operation.

b. FIRST LO MODE. This switch enables the operator to select the mode of operation of the first local oscillator. The XTAL position is used when the crystal oscillator mode of operation is desired. The VFO position is used when the variable frequency oscillator mode of operation is desired.

c. FREQUENCY (dial). The frequency dial indicates in megacycles the frequency to which the receiver is tuned when the operator varies the TUNING control.

Figure 3-1 shows front panel controls of the Model RTH-B18 RF Tuning Unit.

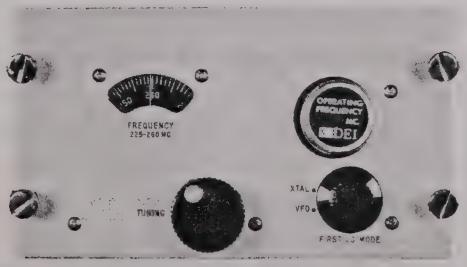


Figure 3-1. Model RTH-B18 RF Tuning Unit, Front Panel View

SECTION IV
RANGE MAINTENANCE

4-1 INTRODUCTION

The Model RTH-B18 RF Tuning Unit is designed to give troublefree performance in the field with a minimum of routine maintenance. High quality components, conservatively rated, are used in the fabrication of the rf tuning unit with emphasis placed on operation well within ratings. During normal operation, no periodic calibration or realignment should be necessary. Unnecessary adjustments may degrade the performance of the rf tuning unit and therefore should be avoided. For these reasons, preventive maintenance is limited to the checks described in paragraph 4-2.

The preventive maintenance checks given should be performed at the recommended interval to prevent malfunctions and needless interruptions while the rf tuning unit is in service. When performing these checks, if a malfunction is detected, refer to Section V for service instructions. Periodic visual inspections should be made of the unit for evidence of corrosion, loose connections, burned wiring insulation, and loose, burned, or charred component parts. For installation procedures in replacing a component part, refer to paragraph 4-3.

A clean interior is necessary to ensure optimum performance by preventing corrosion and dirt from damaging parts or causing leakage between circuit points. Keeping the rf tuning unit relatively clean and dust-free, as well as,in good mechanical condition is considered to be in keeping with good operating practices and is emphasized as a preventive maintenance procedure.

A primary requirement involving preventive maintenance of the rf tuning unit is the operator's thorough knowledge of the unit's operation, theory of operation, and preventive maintenance techniques.

The operator's understanding of any specified limitations and awareness of precautions applicable to the operation of the unit will thus maximize reliable unit performance and prolong its service time.

4-2 RECOMMENDED SCHEDULES

The recommended schedules consist of preventive maintenance checks to be performed in intervals of semiannual periods.

4-2.1 Semiannual Preventive Maintenance. The following checks, performed semiannually, will ensure reliable performance of the rf tuning unit.

4-2.1.1 Local Oscillator Frequency. For optimum performance of the rf tuning unit, the frequency of the local oscillator must be precisely 30 mc higher than the frequency to which the rf amplifier is adjusted. The following procedure is intended to ascertain that this relationship exists.

Recommended Equipment:

Electronic Counter	HP 5245L
Converter Unit	HP 5253B
Test Cable	DEI B32253

a. Place the POWER switch on the front panel of the TMR-18 receiver to the OFF position. Remove the rf tuning unit from the TMR-18 receiver by loosening the four knurled thumbscrews and sliding the unit out of the receiver.

b. Connect the B32253 test cable plug to J3 of the receiver's main chassis. Connect the B32253 test cable receptacle connector to P2 of the rf tuning unit. Apply power to tuning unit by placing the TMR-18 POWER switch in the ON position.

c. Connect the HP 5245L to the junction of R49 and R51. Observe the HP 5245L for an indication of 127.5 mc and 145 mc when the tuning dial is set to 225 mc and 260 mc, respectively. (The allowable tuning-dial error is ±1%.)

4-2.1.2 AGC Level. When the agc voltage applied to the rf tuning unit is properly adjusted, the unit should provide less than unity gain with 227 mv of rf input signal level. The agc level is adjustable by varying R58, physically located on the top rf tuning unit.

To check the tuning unit agc, proceed as follows:

NOTE

Before checking or making the agc level adjustment to the rf tuning unit, ascertain that agc adjustment external to the tuning unit has been made correctly. Refer to the instruction manual for the Model TMR-18 Telemetry Receiver, when performing this check.

Recommended Equipment:

Signal Generator	HP 608D
DC VTVM	HP 412A

4-2.1.2.1 AGC Level Adjust.

a. Set up the rf tuning unit as described in paragraph 4-2.1.1.

b. Connect the HP 412A between XA6 Pin 4 and ground.

c. Connect the output of the signal generator, adjusted to 260 mc at 50 mv to P3. Tune in the signal with the TUNING control. The voltage level measured on the HP 412A should be 8 volts dc. If this voltage is not correct then adjust R58 for proper agc voltage.

4-3 ASSEMBLY AND DISASSEMBLY

The rf tuning unit is assembled and disassembled in a reasonably straightforward manner and should pose no difficulty to servicing personnel. Component part removal and replacement may be accomplished by using straightforward disassembly techniques for parts accessible from the top and bottom of the unit. Replacement is accomplished by using straightforward assembly techniques which are usually the reverse of disassembly.

In the event of component replacement, the rf tuning unit may require alignment. In general, it will be necessary to align only the circuit associated with the stage in which repairs were made. Always allow at least 20 minutes of warmup time before attempting any alignment procedures.

Care should be exercised when removing or replacing component parts not to damage or disturb other component parts mounted in close proximity to the specific part.

To replace a faulty component part such as a tube or switch, perform the following general procedures so that the receiver may be restored to its complete operating capacity in the minimum amount of time.

a. Have the repair parts available. (Refer to Section VII for a complete list of repair parts.)

b. Locate the suspected faulty part by isolating the malfunction and by performing adequate tests to determine the trouble.

c. Remove the faulty part from the unit by using straightforward disassembly techniques.

d. Using the appropriate test equipment, perform tests on the part to obtain an indication of its operable condition. If the results reveal evidence of a malfunction, replace the part with an appropriate spare. Install the new part in the same physical position as the original part, using straightforward assembly procedures.

The following component parts are located on the top of the unit:

a. Inductuner

b. Crystal oscillator socket

c. Miscellaneous resistors and capacitors

d. AGC adjust potentiometer R58

e. Gear train

f. Transformers

g. RF Amplifier V1

To replace a component part accessible from the bottom of the unit, perform the following general procedure for each item.

a. Remove the bottom cover retaining screws and the bottom cover from the unit.

b. To replace a nuvistor tube, loosen the finger bar retaining screw and move the spring fingers away from the tube socket. Lift the nuvistor tube from its socket. Insert the new tube and secure it to the socket with the spring finger bar retaining screw.

c. To replace a transistor, resistor, capacitor, or inductor, perform the same general procedure as component part replacement mentioned previously. Ensure that the new solder joints are made adequately when resoldering.

SECTION V
BASE MAINTENANCE

5-1 MAJOR OVERHAUL

The Model RTH-B18 RF Tuning Unit has been carefully designed to give long and trouble-free operation. Therefore, should repair become necessary, the corrective maintenance procedures presented in this section should be performed to eliminate the cause of the malfunction and to restore the unit to its original operating condition. For the reasons mentioned previously, it is probable that the need for internal repair will arise only very infrequently.

No specific overhaul procedures are required for this unit. However, each time the unit is serviced a visual inspection should be made of the unit's interior. A clean interior is necessary to ensure optimum performance by preventing corrosion and dirt from damaging parts or causing arc-over or leakage between circuit points. Blow out dust from the inside of the chassis. Be careful that air pressure is not great enough to damage parts or disturb wiring.

After cleaning, make visual inspection of parts and wiring for corrosion, loose connections, frayed and burned insulation, loose screws, and burned or charred resistors. Carefully inspect tube sockets for broken contacts, and capacitors for leakage of oil or filling compound.

Lubrication of the potentiometer or gear train is not required and should be avoided since damage to the components could result.

Troubleshooting techniques should be based upon the performance of the equipment and upon a thorough knowledge of the theory of operation as contained in Section II of this instruction manual. The use of the schematic diagram in Section VIII should facilitate servicing.

Frequently, visual inspection provides a clue to the source of the trouble by enabling location of damaged components, for an example, burned or discolored resistors or chokes, overheating or leaky capacitors.

5-2 SPECIAL COMPONENT FABRICATION AND REPAIR

The rf tuning unit has been designed so that repairs may be made conveniently to its component parts, for an example the rf amplifier, mixer or variable frequency oscillator. These repairs may be accomplished by using the procedures outlined in paragraph 4-3. No specific component fabrication is required to make the necessary repairs. Figure 5-1 shows the only necessary test fixture used when performing the alignment procedure or when operating the unit during troubleshooting or malfunction analysis. Figures 5-2 and 5-3 show the unit's top and bottom views.

5-3 PERFORMANCE REQUIREMENTS

The performance requirements for normal operation of the rf tuning unit are listed in table 1-1. Should performance of the unit deteriorate beyond the requirements specified in table 1-1, realignment may be necessary. To accomplish the realignment of the unit, refer to paragraph 5-6 for complete alignment procedures.

5-4 SPECIAL CORRECTIVE MAINTENANCE REQUIREMENTS

No special corrective maintenance requirement is applicable for the rf tuning unit. The information presented in the preceding and following paragraphs may be utilized to restore the unit to its full operating capabilities.

5-5 INITIAL TEST SET-UP

Remove the tuning unit from the receiver, and install the power jumper cable, B32253, between the TMR-18 and the tuning unit. Insert the crystal, having the desired operating frequency, in the front panel socket of the tuning unit.

Initial Control Settings for TMR-18:

a. Place POWER switch to the ON position.

b. Adjust SECOND LO VERNIER TUNING KC control on zero indicated by a vertical ± line.

c. Place STANDBY/OPERATE switch to OPERATE position.

d. Adjust AUDIO VOLUME to a midrange position.

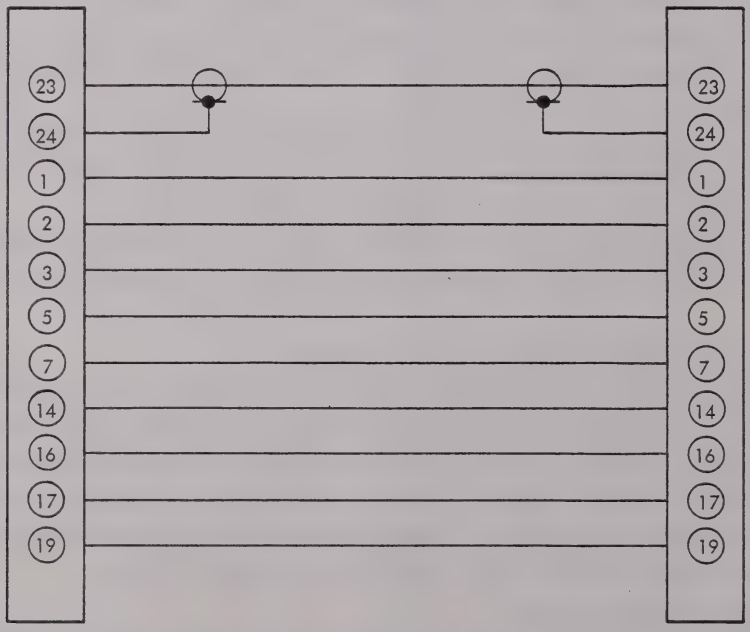


Figure 5-1. B32253 Test Cable, Simplified Schematic Diagram

5-6 ALIGNMENT PROCEDURES

Allow adequate warmup time of 20 minutes before attempting any alignment procedures.

5-6.1 First IF Alignment.

Recommended Equipment:

Termination for Sweep Generator (51 ohm)	
Sweep Generator	Jerrold 900B
Signal Generator	HP 606A
Detector	DEI
Oscilloscope	HP 130C

5-6.1.1 Output Stage Alignment.

a. Install the test bottom cover. Connect the 30 mc sweep generator termination between pin A of T2B and ground on the chassis sidewall. Using the proper impedance cable (55A/U for 51 ohm generators), connect the output of the sweep generator to the termination. Set the 1st LO MODE switch to the XTAL position.

b. Using RG-55A/U cable, connect the output of the signal generator to the input of the DEI detector. Set the generator output to 300 mv at 30 mc. Using a minimum length of RG-62/U cable (3 ft. maximum), connect the output of the detector to the oscilloscope vertical amplifier input. Connect the sweep generator horizontal output to the oscilloscope horizontal input. Adjust the oscilloscope horizontal amplifier for a trace approximately 10 cm long. Adjust the oscilloscope vertical amplifier (DC Coupled) position and sensitivity controls for a 10 cm vertical deflection of the trace when the generator is alternately connected and disconnected at the input of the detector. This oscilloscope sensitivity must be maintained throughout the alignment of the first i-f.

c. Disconnect the generator and connect the detector input to pin 23 of P2, the 30 mc output of the tuning unit. C68, between terminals A and C of T2A, should be disconnected from the latter. Connect the sweep generator output to the termination pin, T2B, and chassis ground. Connect the bypass capacitor between terminals A and D of T2A.

d. Set the sweep generator for a convenient pattern amplitude and adjust T3A and T3B for the proper 30 mc i-f response. This response is:

(1) Peak-to-Valley Ratio: 4% (approximately) as observed on the oscilloscope.

(2) Bandwidth at the 1.5 db response points: 1.0 mc minimum, 1.2 mc maximum, centered at 30 mc.

e. Observe that the baseline on the oscilloscope does not shift when the detector is disconnected at P2. (Any shift of the baseline when the detector is disconnected indicates an oscillating emitter follower.)

f. Disconnect the sweep termination and reconnect C68 to terminal C of T2A.

5-6.1.2 Mixer Output Circuit Alignment.

a. Using a 220 uuf blocking capacitor, Erie HR839-X5F, connect the sweep termination between the grid, pin 4, of V3 and ground on the short shield adjacent to XV3 socket. Connect a source of -1.5 vdc (a battery or a 9:1 divider from the -15v supply) to the test point FT2.

b. Adjust the sweep generator output for a 10 cm trace on the oscilloscope display. Align T2A and T2B for the proper 30 mc i-f response.

This response is:

(1) Peak-to-valley ratio: 8% (approximately) as observed on the oscilloscope.

(2) Bandwidth at the 3 db response points: 1.0 mc minimum, 1.2 mc maximum, centered at 30 mc.

c. Disconnect the termination and blocking capacitor. Disconnect the detector.

5-6.2 XTAL 1st LO and Preliminary Multiplier Alignment.

Recommended Equipment:

Frequency Counter	HP 5245L
Counter Converter Plug-In	HP 5253B
RF Millivoltmeter	HP 411A
VHF Probe	HP 11023A
DC VTVM	RCA WV 98C
Crystals	CR-52A/U at the following three frequencies:

Crystal Frequency	Operating Frequency
a. 42.50000 mc	225 mc
b. 45.33333 mc	242 mc
c. 48.33333 mc	260 mc

5-6.2.1 XTAL 1st LO Checks. Measure and record the first three significant figures of the rf frequency at the collector of Q5 (top of T1) by touching an open UG-1094/U to this point (the UG-1094/U is connected thru 3 feet of RG-62/U cable to the counter plug-in). Perform the check as follows:

a. Check for the presence of rf voltages at the collector of Q5 (top of T1) for each of the CR-52A crystal frequencies using the 411A and VHF probe.

b. Check the rf frequency present at the collector of Q5 (top of T1) by touching an open UG-1094/U to this point. These frequencies present must agree with the frequency stamped on the crystal, for an example, 42.5 mc, 45.3 mc, or 48.3 mc.

5-6.2.2 Preliminary Multiplier Alignment.

a. Connect the counter plug-in to test point E20, using 50 ohm cable. Connect the WV 98C vtvm to FT2.

b. Install the 48.3 mc crystal, set the dial to 260 mc and adjust C55 for maximum signal level at the counter plug-in as indicated by its meter. The counter should also indicate 145 mc.

c. Adjust C60 for maximum negative vtvm voltage indication (approximately -0.6v to -0.8v).

d. Install the 42.5 mc crystal, set the dial to 225 mc and adjust C55 for maximum counter input, noting whether capacity of C55 is increased or decreased. The counter should also indicate 127.5 mc.

e. Adjust C60 for maximum vtvm indication, noting whether capacity is added to or taken out of the circuit.

f. In both instances, addition of capacity to the circuit indicates insufficient tuning range. In order to increase the tuning range in either circuit, the value of the end inductors L 21 and L23 respectively should be reduced by spreading the inductor's turns. The converse situation will also apply to both circuits.

g. Repeat steps b through f as often as required to give the proper tuning range, (no adjustment required of C55 or C60).

5-6.3 VFO 1st LO Alignment and Tracking.

Recommended Equipment:

Frequency Counter	HP 5245L
Counter Converter Plug-in	HP 5253B

5-6.3.1 Tracking Procedure.

a. Connect the counter plug-in input to test point E20, using 50 ohm cable.

b. Set the dial to 260 mc and adjust C38 for a counted frequency of 145.0 mc.

c. Set the dial to 225 mc and adjust C38 for a counted frequency of 127.5 mc, noting whether capacity is added to or removed from the tuned circuit.

d. Addition of capacity to the circuit indicates insufficient tuning range. In order to increase the tuning range, the end inductor (L19) should be reduced in value by spreading turns.

e. Repeat steps b through d as often as required to give the proper tuning range.

f. Set the tuning control for a counted frequency of 136 mc. If the tuning dial indication is 242 ±0.1 mc, proceed to step h. If the dial indication is above 242 mc, the shunt inductor should be reduced in value slightly by spreading turns.

g. Repeat steps b through f as often as required for proper tuning range and dial tracking.

h. Check dial indications for the following counted frequencies:

Frequency	Dial Indication
127.5 mc	225 mc ±.5 mc
132.5 mc	235 mc ±.5 mc
137.5 mc	245 mc ±.5 mc
142.5 mc	255 mc ±.5 mc
145.0 mc	260 mc ±.5 mc

5-6.4 RF Alignment and Tracking.

Recommended Equipment:

RF Sweep Generator	Jerrold 900B
Oscilloscope	HP 130C
Noise Figure Meter	HP H18-340B
Noise Diode	HP 343A
Noise Figure Amplifier	DEI LM22503
Telemetry Receiver	DEI TMR-18

5-6.4.1 RF Interstage.

a. Connect an open UG-1094/U connector between E1 and ground on the adjacent shield corner, after ensuring that L26 is not also attached to E1. Do not use clips, tack solder the connector in the circuit with the shortest possible leads. Apply power to the tuning unit and set the first l-o mode switch to the vfo mode of operation.

b. Connect the output of the sweep generator to the UG-1099/J connector. Connect the oscilloscope vertical input between FT2 and ground, using a maximum of 3 feet of RG-62/U cable.

c. Set the tuning dial to 242 mc and check the tuning of both interstage circuits. This assures that the proper starting point is used and eliminates misadjustment due to incorrect sweep generator setting. Alternatively, the sweep generator may be calibrated using its internal detector and marker system, setting the sweep to 242 mc.

d. Connect the a-m output, TP1 on the fm demodulator subassembly of the TMR-18 receiver, to the Z axis input of the oscilloscope. Set the AGC switch on the rear apron of the TMR-18 receiver to the off position and adjust R11, the IF GAIN ADJUST, accessible with the top cover removed from the receiver.

e. Using the 5 mv/cm oscilloscope sensitivity, ac coupled, and a pattern amplitude of 4 cm to 6 cm, adjust C24 and C29 for maximum pattern amplitude at the blanking mark.

f. Set the dial to 260 mc and repeat step e.

g. Set the dial to 225 mc and repeat step e noting whether capacity is added to or removed from each circuit. Adjust the end inductors (L7 and L9, primary and secondary, respectively) if required.

h. Repeat steps f and g as often as required for proper tuning range.

i. Set the dial to 242 mc and adjust C24 and C29 for maximum amplitude at the blanking marker and the proper double-tuned response, noting whether capacity is added to or removed from each circuit.

j. If capacity must be added to either circuit, tracking is high at this point and the shunt inductor (L8 and L10) must be decreased in value by spreading turns slightly.

k. Repeat steps f through j as often as required for interstage tracking and tuning. By varying C26, adjust the RF bandwidth to 6 mc at a tuning dial indication of 225 mc.

l. Perform the final multiplier alignment. Refer to paragraph 5-6.5. Repeat step k. Set the dial and sweep to 242 mc. Remove the UG-1094/U installed in step a and connect L26 to E1.

5-6.4.2 RF Input Stage.

a. Connect the sweep generator to J1, RF INPUT, on the rear apron of the rf tuning unit.

b. Set C14 to approximately midrange, and tune C3 and C8 for maximum pattern amplitude at the blanking marker.

c. Apply -15 vdc to C10. (Use a cliplead jumper between C10 and C96.) Increase the sweep output and the oscilloscope sensitivity for a visible pattern. Adjust C14 for a minimum pattern amplitude.

d. Remove the cliplead and readjust the sweep output and oscilloscope sensitivity then readjust C8 as in step b.

e. Repeat steps c and d until no adjustment is required of C8 or C14.

f. Set the tuning dial to 260 mc. Adjust C3 and C8 for maximum pattern amplitude at the blanking marker.

g. Set the dial to 225 mc. Adjust C3 and C8 for the proper rf response noting whether capacity is removed from or added to each tuned circuit. Adding capacity to either circuit indicates a lack of tuning range. The primary associated with C3 is handled in a conventional manner. The secondary is adjusted by changing the value of C12, the stray capacity between the two portions of the end inductor, L3 and L4. To increase the value of C12, bend L3 or L4 so that they are closer together.

h. Repeat steps f and g as often as necessary to give the proper tuning range. Adjust the bandwidth of the response at 225 mc for approximately a flat uniformity response.

i. Set the dial to 242 mc. Adjust C3 and C8 for the proper rf response noting if capacity is added to or removed from each circuit.

j. In both cases, if capacity must be added to the circuit, tracking is high at this point. A decrease in value of the shunt inductor, L2 and L5, respectively will decrease the midrange frequency when the end points are correct.

k. Repeat steps f through j as often as required to give proper tuning range and tracking.

l. Adjust the input stage bandwidth by adjusting C6.

m. Connect the Noise Diode output to J1 directly. Connect the 30 mc i-f output of the tuning unit to the noise figure amplifier and the output of the noise figure amplifier to the 30 mc input on the noise figure meter.

n. Tune the RTH-B18 across the band, observing the noise figure meter. Make any adjustments necessary for noise figure minimization and tracking.

o. Repeat the sweep generator oscilloscope blanking marker set-up. Check the rf interstage for optimum shape tracking. Recheck noise figure if any readjustments are made.

5-6.5 Final Multiplier Alignment.

Recommended Equipment:

Frequency Counter	HP 5245L
Counter Converter Plug-in	HP 5253B
DC VTVM	RCA WV-98C
Crystals	CR-52A/U, at the following three frequencies:

Crystal Frequency	Operating Frequency
a. 42.50000 mc	225 mc
b. 45.33333 mc	242 mc
c. 48.33333 mc	260 mc

5-6.5.1 Alignment and Tracking.

a. Connect the counter plug-in to test point E20, using 50 ohm cable. Connect the RCA VTVM to FT2.

b. Set the dial to 260 mc. Set the oscillator mode to VFO. Adjust C55 for maximum signal level at the counter plug-in as indicated by its meter. The counter should also indicate 145 mc.

c. Adjust C60 for maximum negative voltage at FT2 as indicated by the vtvm (approximately -0.6v to -0.8v).

d. Set the dial to 225 mc. Adjust C55 for maximum counter input, noting whether capacity is added to or taken from the circuit. The counter should also indicate 127.5 mc.

e. Adjust C60 for maximum vtvm indication noting whether capacity is added to or removed from the circuit.

f. In both instances, addition of capacity to the circuit indicates insufficient tuning range. In order to increase the tuning range, the end inductor, L21 and L23, respectively, should be reduced in value by spreading turns. The converse situation will also apply to both circuits.

g. Repeat steps b through f as often as required to give the proper tuning range. No adjustment is required of C55 or C60.

h. Set the dial to 242 mc. Adjust C55 for maximum counter input, noting whether capacity is added to or taken from the circuit. The counter should also indicate 136 mc.

i. Adjust C50 for maximum vtvm indication, noting whether capacity is added to or taken from the circuit.

j. In both cases, if capacity must be removed from the circuit, tracking is low at this point. An increase in value of the shunt inductor, L22 and L24, respectively, accomplished by compressing the coil slightly, will increase the midrange frequency when the end-points are correct.

k. Repeat steps b through g.

l. Repeat steps h through k as often as required to give the proper tuning range and tracking when no adjustment is required of C55 or C60 at any of the three points.

m. Check oscillator injection. Oscillator injection should be -0.6v minimum for all crystals and vfo when tuned across the band.

5-6.6 AGC Setup.

Recommended Equipment:

Signal Generator	HP 608D
Receiver	DEI TMR-18
DC VTVM (accurate within 1%)	HP 412A

5-6.6.1 Setup Procedure.

a. With the top and bottom covers of the receiver removed and the bottom cover of the rf tuning unit removed, connect the HP 412 between pin 4 of XA6 and ground, tune in an 0 dbm cw signal at 260 mc.

b. Adjust R58 on the RTH-B18 (at the rear of the unit) for -8.0 vdc vtvm reading.

The alignment is complete; disconnect the test equipment.

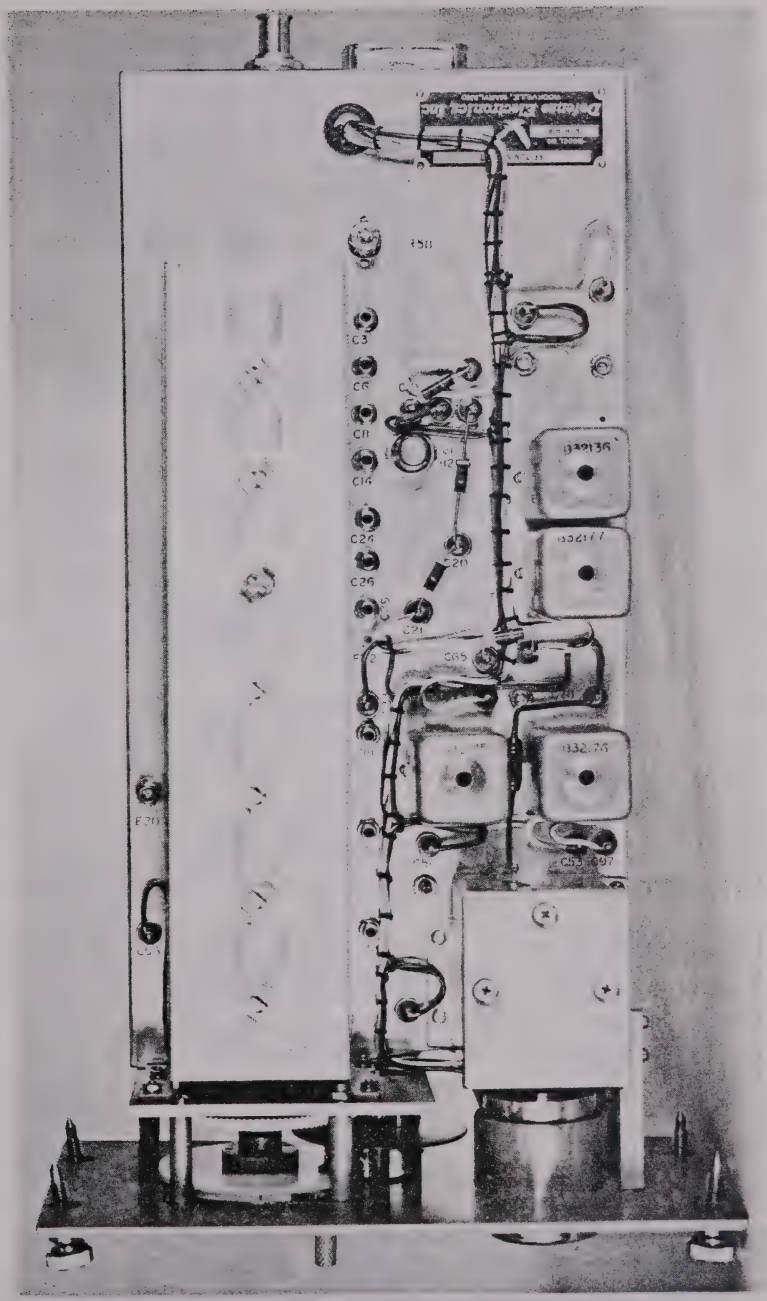


Figure 5-2. Model RTH-B18 RF Tuning Unit, Top View

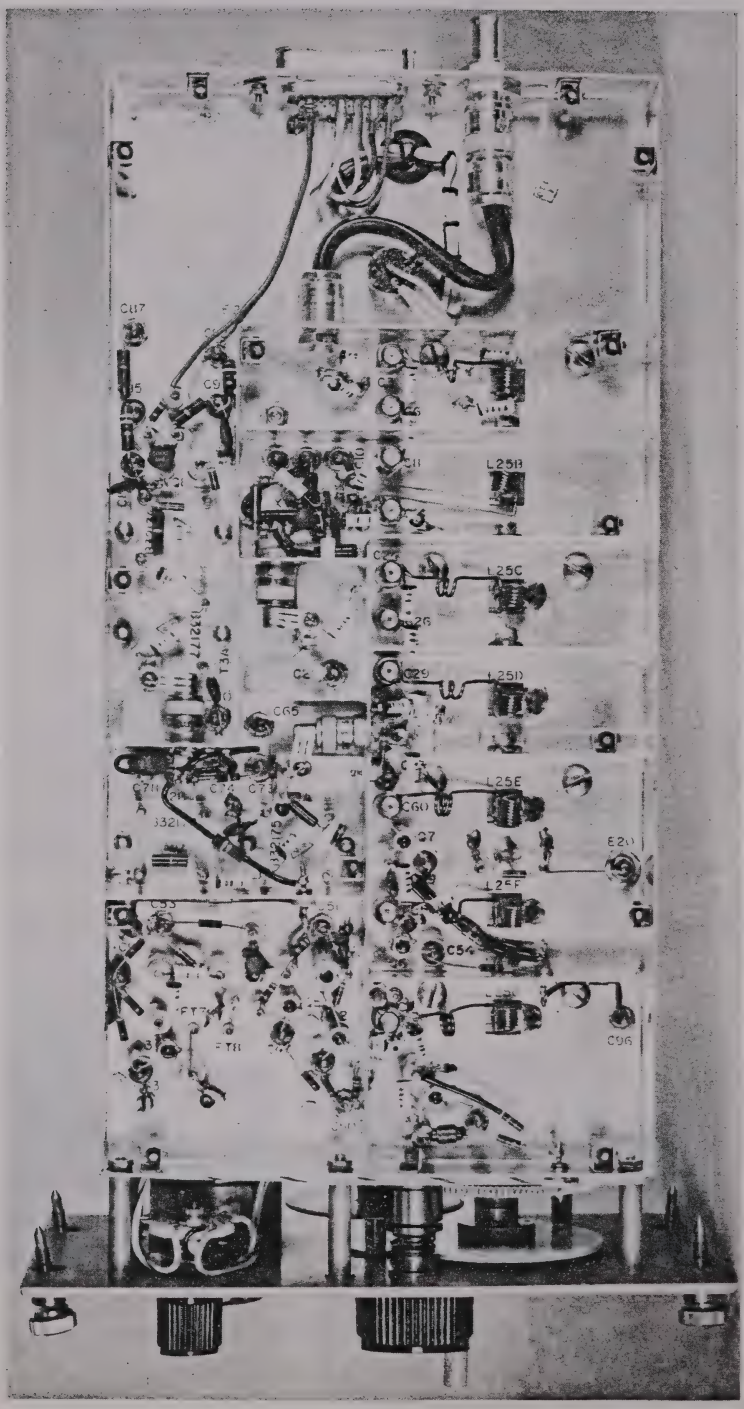


Figure 5-3. Model RTH-B18 RF Tuning Unit, Bottom View with Cover Removed

SECTION VI
INSTALLATION

6-1 RECEIPT AND UNPACKING

Upon receipt of the Model RTH-B18 RF Tuning Unit, it should be unpacked and inspected for in-transit damage. When unpacking the unit, carefully open the outer packing material and lift out the inner package. Unwrap the inner package, ensuring that no hard or sharp tools touch the unit. Remove the unit from the inner package and place it in an upright position.

NOTE

The shipping containers are designed specifically to protect the unit from damage during normal handling. Any damage to the unit is an indication of improper handling. If there is any damage, notify the proper authority immediately.

The empty shipping material should be retained to be used in the event that the unit is to be stored or shipped at some later date.

6-2 INSPECTION

Inspect the chassis for security of components and loose or disconnected wiring. Inspect the interior for damage to connectors and component parts. If the unit is not to be installed within a short period of time after it is received, it should be unpacked and inspected, then repacked and stored in an upright position. The environment of the storage area should be similar to that in which the unit will eventually be employed. (Refer to paragraph 6-4 for storage instructions.)

6-3 MOUNTING

The rf tuning unit is in the form of a plug-in module. All electrical connections are made automatically through a Blue Ribbon and a coaxial connector as the unit is inserted into the main chassis of the Model TMR-18 Telemetry Receiver. There are no cables to be manually connected during installation, or disconnected during removal.

To install the rf tuning unit, insert it through the opening at the lower right-hand side of the receiver's front panel. Carefully push the unit into the receiver until the connectors mate with each other. Some resistance will be noticed as the tuning unit's front panel nears the receiver's front panel; this is due to the mating of the connectors. Tighten the four knurled thumbscrews until the unit is securely mounted in the receiver.

To remove the rf tuning unit, unscrew the four thumbscrews and carefully withdraw the tuning unit from the main chassis of the receiver.

6-4 STORAGE

In the event the tuning unit is to be stored for a prolonged period of time, place the unit in its original shipping container, paragraph 6-1, or equivalent. Repack the original shipping container. Store the packed carton in a dry area similar to the environment in which the unit will eventually be employed, so that the unit does not encounter weather effects which may cause corrosion.

6-5 PHYSICAL CHARACTERISTICS

The Model RTH-B18 RF Tuning Unit weighs approximately 6 pounds and occupies 4 inches of height and 7-1/2 inches of width of the Model TMR-18 Telemetry Receiver front panel. The rf tuning unit is

mounted in the receiver's main chassis and is secured to the receiver's front panel with four knurled thumbscrews as mentioned in paragraph 6-3.

When installing the tuning unit in the TMR-18 receiver, be certain that there is no appreciable resistance while inserting the unit into the receiver to avoid damaging the plug-in type connector.

6-6 SPECIAL MOUNTING REQUIREMENTS

There are no special mounting requirements to be adhered to when installing the tuning unit in the receiver. Use caution not to damage the unit either by dropping or misalignment of connector on the tuning unit or receiver when installing the unit in the receiver.

SECTION VII
PARTS LIST

7-1 INTRODUCTION

The electrical parts listed in this section reference those shown on schematic diagrams in Section VIII. Each part is listed alphanumerically by its reference designation; the letter identifies the type of part, for an example, C for capacitor, R for resistor, and L for inductor.

When ordering replacement parts, include the model and serial numbers of the unit, the reference symbol designation and the complete nomenclature of the part as given in the parts list.

RF TUNING UNIT

Reference Designation	Description	Federal Stock No.	Est. Unit Cost	Recm'd. Spares
C1	Capacitor, ceramic, tubular, 13 uuf ±5%, Erie NPO-301-000		$ .44*46	
C2	Capacitor, ceramic, tubular, 5.6 uuf ±0.25 uuf, Erie NPO-301-000		.60*34	
C3	Capacitor, variable, glass, 0.8 - 8.5 uuf, JFD VC20-GYCE		11.72	2
C4	Capacitor, ceramic, tubular, 1.3 uuf ±0.1 uuf, Erie NPO-301-000		1.12*18	
C5	Capacitor, ceramic, tubular, 10 uuf ±5%, Erie NPO-301-000		.44*46	
C6	Capacitor, variable, glass, 0.8 - 4.5 uuf, JFD VC21-GYCE		11.10	1
C7	Capacitor, ceramic, tubular, 2 uuf ±0.1 uuf, Erie NPO-301-000		1.12*18	
C8	Capacitor, variable, glass, 0.8 - 8.5 uuf, JFD VC20-GYCE		11.72	
C9	Capacitor, standoff, 0.001 uf, GMV, Allen Bradley SSA5-102W		1.04*18	
C10	Capacitor, feedthru, 0.001 uf, GMV, Allen Bradley FA5C-102W	5910-802-7432	1.04*18	
C11	Capacitor, ceramic, tubular, 5.1 uuf ±0.25 uuf, Erie NPO-301-000		2.08*10	
C12	Capacitor, adjustable, stray			
C13	Capacitor, ceramic, tubular, 3 uuf ±0.1 uuf, Erie NPO-301-000		1.12*18	
C14	Capacitor, variable, glass, 0.8 - 8.5 uuf, JFD VC20-GYCE		11.72	2
C15	Capacitor, ceramic, tubular, 18 uuf ±5%, Erie NPO-301-000		.44*46	
C16	Not assigned			
C17	Capacitor, feedthru, 0.001 uf, GMV, Allen Bradley FA5C-102W	5910-802-7432	1.04*18	2

* See page 7-10.

RF TUNING UNIT, cont'd

Reference Designation	Description	Federal Stock No.	Est. Unit Cost	Recm'd. Spares
C18	Capacitor, disc, 100 uuf ±10%, Erie HR839-X5F		$ 2.04*10	
C19	Capacitor, disc, 100 uuf ±10%, Erie HR839-X5F		2.04*10	
C20	Capacitor, standoff, 0.001 uf, GMV, Allen Bradley SSA5-102W		2.04*10	2
C21	Capacitor, feedthru, 0.001 uf, GMV, Allen Bradley FA5C-102W	5910-802-7432	1.04*18	2
C22	Capacitor, ceramic, tubular, 18 uuf ±5%, Erie NPO-301-000		.44*46	
C23	Capacitor, feedthru, 0.001 uf, GMV, Allen Bradley FA5C-102W	5910-802-7432	1.04*18	2
C24	Capacitor, variable, glass, 0.8 - 8.5 uuf, JFD VC20-GYCE		11.72	2
C25	Capacitor, ceramic, tubular, 0.1 uuf ±0.1 uuf, Erie NPO-301-000		1.12*18	
C26	Capacitor, variable, glass, 0.8 - 4.5 uuf, JFD VC21-GYCE		11.10	1
C27	Capacitor, ceramic, tubular, 1.0 uuf ±0.1 uuf, Erie NPO-301-000		1.16*18	
C28	Capacitor, ceramic, disc, 47 uuf ±10%, Erie NPO-308-000		.56*36	
C29	Capacitor, variable, glass, 0.8 - 8.5 uuf, JFD VC20-GYCE		11.72	2
C30	Capacitor, ceramic, tubular, 4.3 uuf ±0.25 uuf, Erie NPO-301-000		.44*46	
C31	Capacitor, ceramic, tubular, 1.5 uuf ±0.1 uuf, Erie NPO-301-000		1.12*18	
C32	Capacitor, ceramic, disc, 0.001 uf ±10%, Erie HR809-X5T		.44*46	
C33	Capacitor, feedthru, 0.001 uf, GMV, Allen Bradley FA5C-102W	5910-802-7432	1.04*18	
C34	Capacitor, ceramic, tubular, 47 uuf ±5%, Erie NPO-308-000		.56*36	
C35	Capacitor, ceramic, tubular, 20 uuf ±5%, Erie NPO-301-000		.44*46	
C36	Capacitor, standoff, 0.001 uf, GMV, Allen Bradley SSA5-102W		1.04*18	2
C37	Capacitor, ceramic, tubular, 16 uuf ±5%, Erie NPO-301-000		.44*46	
C38	Capacitor, variable, glass, 0.8 - 8.5 uuf, JFD VC20-GYCE		11.72	2
C39	Capacitor, ceramic, tubular, 27 uuf ±5%, Erie NPOT-308-000		.56*36	
C40	Capacitor, ceramic, tubular, 6.2 uuf ±0.25 uuf, Erie NPO-301-000		.96*21	

*See page 7-10.

RF TUNING UNIT, Cont'd

Reference Designation	Description	Federal Stock No.	Est. Unit Cost	Recm'd. Spares
C41	Capacitor, standoff, 0.001 uf, GMV, Allen Bradley SSA5-102W		$ 1.04*18	2
C42	Capacitor, feedthru, 0.001 uf, GMV, Allen Bradley FA5C-102W	5910-802-7432	1.04*18	2
C43	Capacitor, standoff, 0.001 uf, GMV, Allen Bradley SSA5-102W		1.04*18	2
C44	Capacitor, ceramic, tubular, 5.1 uuf ±0.25 uuf, Erie NPO-301-000		2.08*10	
C45	Capacitor, ceramic, tubular, 8.2 uuf ±0.5 uuf, Erie NPO-301-000		.44*46	
C46	Capacitor, ceramic, disc, 470 uuf ±10%, Erie HR839-X5F		2.04*10	
C47	Capacitor, standoff, 0.001 uf, GMV, Allen Bradley SSA5-102W		1.04*18	2
C48	Not Assigned			
C49	Capacitor, feedthru, 0.001 uf, GMV, Allen Bradley FA5C-102W	5910-802-7432	1.04*18	2
C50	Capacitor, feedthru, 0.001 uf, GMV, Allen Bradley FA5C-102W	5910-802-7432	1.04*18	2
C51	Capacitor, feedthru, 0.001 uf, GMV, Allen Bradley FA5C-102W	5910-802-7432	1.04*18	2
C52	Capacitor, ceramic, disc, 470 uuf ±10%, Erie HR839-X5F		2.04*10	
C53	Capacitor, feedthru, 0.001 uf, GMV, Allen Bradley FA5C-102W	5910-802-7432	1.04*18	2
C54	Capacitor, standoff, 0.001 uf, GMV, Allen Bradley SSA5-102W		1.04*18	2
C55	Capacitor, variable, glass, 0.8 - 8.5 uuf, JFD VC20-GYCE		11.72	2
C56	Capacitor, ceramic, tubular, 2.7 uuf ±0.1 uuf, Erie NPO-301-000		1.12*18	
C57	Capacitor, ceramic, tubular, 5.1 ±0.25 uuf Erie NPO-301-000		2.08*10	
C58	Capacitor, feedthru, 0.001 uf, GMV, Allen Bradley FA5C-102W	5910-802-7432	1.04*18	2
C59	Capacitor, standoff, 0.001 uf, GMV, Allen Bradley SSA5-102W		1.04*18	2
C60	Capacitor, variable, glass, 0.8 - 8.5 uuf, JFD VC20-GYCE		11.72	2
C61	Capacitor, ceramic, tubular, 2 uuf ±0.1 uuf, Erie NPO-301-000		1.12*18	
C62	Capacitor, ceramic, tubular, 10 uuf ±5%, Erie NPO-301-000		.44*46	
C63	Capacitor, ceramic, disc, 0.0015 uf +100% -20%, Erie CK61Y152Z		.72*28	

* See page 7-10.

RF TUNING UNIT, Cont'd

Reference Designation	Description	Federal Stock No.	Est. Unit Cost	Recm'd. Spares
C64	Capacitor, feedthru, 0.001 uf, GMV, Allen Bradley FA5C-102W	5910-802-7432	$ 1.04*18	2
C65	Capacitor, feedthru, 0.001 uf, GMV, Allen Bradley FA5C-102W	5910-802-7432	1.04*18	2
C66	Capacitor, ceramic, disc, 0.0015 uf +100% -20%, Erie CK61Y152Z		.72*28	
C67	Capacitor, integral part of T2A			
C68	Capacitor, ceramic, tubular, 2.7 uuf ±0.1 uuf, Erie NPO-301-000		1.12*18	
C69	Capacitor, ceramic, tubular, 2.7 uuf ±0.1 uuf, Erie NPO-301-000		1.12*18	
C70	Capacitor, integral part of T2B			
C71	Capacitor, integral part of T2B			
C72	Not assigned			
C73	Capacitor, feedthru, 0.001 uf, GMV, Allen Bradley FA5C-102W	5910-802-7432	1.04*18	2
C74	Capacitor, standoff, 0.001 uf, GMV, Allen Bradley SSA5-102W		1.04*18	2
C75	Capacitor, ceramic, disc, 0.001 uf ±10% Erie HR809-X5T		.44*46	
C76	Capacitor, ceramic, disc, 0.001 uf ±10% Erie HR809-X5T		.44*46	
C77	Capacitor, ceramic, disc, 0.0015 uf +100% -20%, Erie CK61Y152Z		.72*28	
C78	Capacitor, feedthru, 0.001 uf, GMV, Allen Bradley FA5C-102W	5910-802-7432	1.04*18	2
C79	Capacitor, ceramic, disc, 0.0015 uf, +100% -20%, Erie CK61Y152Z		.72*28	
C80	Capacitor, feedthru, 0.001 uf, GMV, Allen Bradley FA5C-102W	5910-802-7432	1.04*18	2
C81	Capacitor, integral part of T3A			
C82	Capacitor, ceramic, tubular, 2.0 uuf ±0.1 uuf, Erie WPO-301-000		1.12*18	
C83	Capacitor, ceramic, tubular, 2.2 uuf ±0.1 uuf, Erie WPO-301-000		1.12*18	
C84	Capacitor, integral part of T3B			
C85	Capacitor, standoff, 0.001 uf, GMV, Allen Bradley SSA5-102W		1.04*18	2
C86	Capacitor, standoff, 0.001 uf, GMV, Allen Bradley SSA5-102W		1.04*18	2
C87	Capacitor, feedthru, 0.001 uf, GMV, Allen Bradley FA5C-102W	5910-802-7432	1.04*18	2
C88	Capacitor, ceramic, disc, 0.001 uf ±10%, Erie HR809-X5T		.44*46	

*See page 7-10.

RF TUNING UNIT, Cont'd

Reference Designation	Description	Federal Stock No.	Est. Unit Cost	Recom'd. Spares
C89	Capacitor, ceramic, disc, 0.0015 uf, +100% -20%, Erie CK61Y152Z		$ .72*28	
C90	Capacitor, ceramic, disc, 0.0015 uf, +100% -20%, Erie CK61Y152Z		.72*28	
C91	Capacitor, standoff, 0.001 uf, GMV, Allen Bradley SSA5-102W		1.04*18	2
C92	Capacitor, feedthru, 0.001 uf, GMV, Allen Bradley FA5C-102W	5910-802-7432	1.04*18	2
C93	Not assigned			
C94	Not assigned			
C95	Capacitor, integral part of T3B			
C96	Capacitor, feedthru, 0.001 uf, GMV, Allen Bradley FA5C-102W	5910-802-7432	1.04*18	2
C97	Capacitor, feedthru, 0.001, GMV, Allen Bradley FA5C-102W	5910-802-7432	1.04*18	2
C98	Capacitor, ceramic, tubular, 10 uuf ±5%, Erie 301-N150A		.44*46	
C99	Capacitor, ceramic, tubular, 10 uuf ±5%, Erie 301-N470A		1.12*18	
C100	Capacitor, ceramic, tubular, 20 uuf ±5%, Erie NPOA-301-000		.44*46	
C101	Capacitor, ceramic, tubular, 10 uuf ±5%, Erie NPOA-301-000		.44*46	
C102	Capacitor, ceramic, disc, 0.001 uf, +100% -20%, Erie CK61Y102Z	5910-666-7156	.76*27	
C103	Capacitor, ceramic, tubular, 6.2 uuf ±0.25 uuf, Erie NPO-301-000		.96*21	
C104	Capacitor, ceramic, tubular, 10 uuf ±5%, Erie NPO-301-000		.44*46	
J1	Socket, octal, TS101P01	5935-260-0517	1.40	
L1	Inductor, adjustable, DEI A18277		17.50	1
L2	Inductor, adjustable, DEI A18278		17.50	1
L3	Inductor, adjustable, DEI A18279		8.50	1
L4	Inductor, adjustable, DEI A18280		8.50	1
L5	Inductor, adjustable, DEI A18281		17.50	1
L6	Inductor, fixed, DEI A18274		29.75	1
L7	Inductor, adjustable, DEI A18282		17.50	1
L8	Inductor, adjustable, DEI A18283		17.50	1
L9	Inductor, adjustable, DEI A18284		17.50	1
L10	Inductor, adjustable, DEI A18285		17.50	1
L11	Inductor, fixed, DEI A18275		29.50	1

* See page 7-10.

RF TUNING UNIT, Cont'd

Reference Designation	Description	Federal Stock No.	Est. Unit Cost	Spares Recom'd.
L12	Inductor, fixed, 0.56 uh ±20%, Essex WEE-0.56		$ 4.80*5	1
L13	Inductor, fixed, 0.56 uh ±20%, Essex WEE-0.56		4.80*5	
L14	Inductor, fixed, 1.8 uh, DEI A10304		29.75	2
L15	Inductor, fixed, 1.8 uh, DEI A10304		29.75	
L16	Inductor, fixed, 1.8 uh, DEI A10304		29.75	
L17	Inductor, fixed, 1.8 uh, DEI A10304		29.75	
L18	Inductor, fixed, 15 uh ±10%, Wilco 1015-15		.44*46	1
L19	Inductor, adjustable, DEI A18286		17.50	1
L20	Inductor, adjustable, DEI A18287		17.50	1
L21	Inductor, adjustable, DEI A18288		17.50	1
L22	Inductor, adjustable, DEI A18289		17.50	1
L23	Inductor, adjustable, DEI A18290		17.50	1
L24	Inductor, adjustable, DEI A18291		17.50	1
L25	Inductor, variable inductuner, DEI C17914		436.62	
L26	Inductor, fixed, DEI A40703		29.75	
L27	Inductor, integral part of T2A			
L28	Inductor, integral part of T2B			
L29	Inductor, fixed, 1.8 uh, DEI A10-304		29.75	
L30	Inductor, integral part of T3A			
L31	Inductor, integral part of T3B			
L32	Inductor, fixed, 2.7 uh, DEI B10-270		29.75	1
P1	Connector, integral part of W1			
P2	Connector, miniature, 36 contact, Amphenol 57-10360		8.10	
P3	Connector, BNC, push-on, DEI A18269		88.90	1
Q1	Transistor, silicon, npn, Motorola 2N3291		6.75	2
Q2	Transistor, silicon, npn, Motorola 2N3291		6.75	
Q3	Transistor, silicon, npn, Motorola 2N3478		6.18	2
Q4	Transistor, silicon, npn, Motorola 2N3478		6.18	
Q5	Transistor, silicon, npn, Motorola 2N3291		6.75	
Q6	Transistor, silicon, npn, Motorola 2N3478		6.18	

*See page 7-10.

RF TUNING UNIT, Cont'd

Reference Designation	Description	Federal Stock No.	Est. Unit Cost	Spares Recom'd.
Q7	Transistor, silicon, npn, Motorola 2N3291		$ 6.75	
Q8	Transistor, silicon, npn, Motorola 2N3291		6.75	
R1	Resistor, fixed, composition, 100k ±5%, 1/4w, Allen Bradley CB1045	5905-577-9674	.29	
R2	Resistor, fixed, composition, 100k ±5%, 1/4w, Allen Bradley CB1045	5905-577-9674	.56	
R3	Not assigned			
R4	Not assigned			
R5	Not assigned			
R6	Resistor, fixed, composition, 910Ω ±5%, 1/2w, Allen Bradley EB9115	5905-583-5391	.24	
R7	Resistor, fixed, composition, 910Ω ±5%, 1/2w, Allen Bradley EB9115	5905-583-5391	.24	
R8	Resistor, fixed, composition, 36Ω ±5%, 1/4w, Allen Bradley CB3605		.29	
R9	Resistor, fixed, composition, 470k ±5%, 1/4w, Allen Bradley CB4745	5905-577-9671	.29	
R10	Resistor, fixed, composition, 470K ±5%, 1/4w, Allen Bradley CB4745	5905-577-9671	.29	
R11	Resistor, fixed, composition, 20k ±5%, 1/4w, Allen Bradley CB2035	5905-578-9697	.29	
R12	Resistor, fixed, composition, 1k ±5%, 1/4w, Allen Bradley CB1025	5905-577-9495	.29	
R13	Resistor, fixed, composition, 1k ±5%, 1/4w, Allen Bradley CB1025	5905-577-9495	.29	
R14	Resistor, fixed, composition, 7.5k ±5%, 1/2w, Allen Bradley EB7525	5905-081-4704	.24	
R15	Not assigned			
R16	Resistor, fixed, composition, 220k ±5%, 1/4w, Allen Bradley CB2245	5905-577-9460	.29	
R17	Resistor, fixed, composition, 68Ω ±5%, 1/4w, Allen Bradley CB6805	5905-577-9593	.29	
R18	Resistor, fixed, composition, 22Ω ±5%, 1/4w, Allen Bradley CB2205		.29	
R19	Resistor, fixed, composition, 20k ±5%, 1/2w, Allen Bradley EB2035	5905-578-9697	.24	
R20	Resistor, fixed, composition, 470Ω ±5%, 1/2w, Allen Bradley EB4715	5905-807-6469	.24	
R21	Resistor, fixed, composition, 1k ±5%, 1/4w, Allen Bradley CB1025	5905-577-9495	.56	
R22	Resistor, fixed, composition, 91Ω ±5%, 1/4w, Allen Bradley CB9105	5905-577-9467	.29	

RF TUNING UNIT, Cont'd

Reference Designation	Description	Federal Stock No.	Est. Unit Cost	Recom'd. Spares
R23	Resistor, fixed, composition, 240Ω ±5%, 1/4w, Allen Bradley CB2415	5905-577-9452	$ .29	
R24	Resistor, fixed, composition, 240Ω ±5%, 1/2w, Allen Bradley EB2415		.24	
R25	Resistor, fixed, composition, 2.7k ±5%, 1/2w, Allen Bradley EB2725	5905-800-9297	.24	
R26	Resistor, fixed, composition, 7.5k ±5%, 1/2w, Allen Bradley EB7525	5905-847-4353 -EF	.24	
R27	Resistor, fixed, composition, 33Ω ±5%, 1/4w, Allen Bradley CB3305	5905-992-3802 -NT	.29	
R28	Resistor, fixed, composition, 430Ω ±5%, 1/2w, Allen Bradley EB4315		.24	
R29	Resistor, fixed, composition, 120Ω ±5%, 1/2w, Allen Bradley EB1215	5905-807-7507	.24	
R30	Resistor, fixed, composition, 1k ±5%, 1/4w, Allen Bradley CB1025	5905-577-9495	.29	
R31	Resistor, fixed, composition, 2.4k ±5%, 1/4w, Allen Bradley CB2425		.29	
R32	Resistor, fixed, composition, 4.3k ±5%, 1/4w, Allen Bradley CB4325	5905-577-9688	.29	
R33	Resistor, fixed, composition, 3.3k ±5%, 1/4w, Allen Bradley CB3325	5905-716-4841	.29	
R34	Resistor, fixed, composition, 510Ω ±5%, 1/4w, Allen Bradley CB5115	5905-577-9484	.29	
R35	Resistor, fixed, composition, 1k ±5%, 1/4w, Allen Bradley CB1025	5905-577-9495	.56	
R36	Resistor, fixed, composition, 2.7k ±5%, 1/4w, Allen Bradley CB2725	5905-577-9481	.29	
R37	Resistor, fixed, composition, 4.7k ±5%, 1/4w, Allen Bradley CB4725	5905-577-9483	.29	
R38	Resistor, fixed, composition, 2.4k ±5%, 1/4w, Allen Bradley CB2425		.29	
R39	Resistor, fixed, composition, 510Ω ±5%, 1/4w, Allen Bradley CB5115	5905-577-9484	.29	
R40	Resistor, fixed, composition, 2k ±5%, 1/4w, Allen Bradley CB2025	5905-577-9454	.29	
R41	Resistor, fixed, composition, 3.3k ±5%, 1/4w, Allen Bradley CB3325	5905-716-4841	.29	
R42	Resistor, fixed, composition, 820Ω ±5%, 1/4w, Allen Bradley CB8215	5905-577-9681	.29	
R43	Resistor, fixed, composition, 2k ±5%, 1/4w, Allen Bradley CB2025	5905-577-9454	.29	
R44	Resistor, fixed, composition, 3.3k ±5%, 1/4w, Allen Bradley CB3325	5905-716-4841	.29	
R45	Resistor, fixed, composition, 820Ω ±5%, 1/4w, Allen Bradley CB8215	5905-577-9681	.29	

RF TUNING UNIT, Cont'd

Reference Designation	Description	Federal Stock No.	Est. Unit Cost	Recom'd. Spares
R46	Resistor, fixed, composition, 4.3k ±5%, 1/4w, Allen Bradley CB4325	5905-577-9688	$ .29	
R47	Resistor, fixed, composition, 2.4k ±5%, 1/4w, Allen Bradley CB2425		.29	
R48	Resistor, fixed, composition, 1.6k ±5%, 1/4w, Allen Bradley CB1625	5905-850-8068-FB	.29	
R49	Resistor, fixed, composition, 100Ω ±5%, 1/4w, Allen Bradley CB1015	5905-577-9497	.29	
R50	Resistor, fixed, composition, 160Ω ±5%, 1/4w, Allen Bradley CB1615		.29	
R51	Resistor, fixed, composition, 62Ω ±5%, 1/4w, Allen Bradley CB6205	5905-577-9679	.29	
R52	Resistor, fixed, composition, 4.3k ±5%, 1/4w, Allen Bradley CB4325	5905-577-9688	.29	
R53	Resistor, fixed, composition, 2.4k ±5%, 1/4w, Allen Bradley CB2425		.29	
R54	Resistor, fixed, composition, 1.6k ±5%, 1/4w, Allen Bradley CB1625	5905-850-8068-FB	.29	
R55	Not assigned			
R56	Not assigned			
R57	Not assigned			
R58	Resistor, variable, composition, 100k, Clarostat RV6LAYSA104A		6.21	1
R59	Resistor, fixed composition, 39Ω ±5%, 1/4w, Allen Bradley CB3905		.29	
R60	Resistor, fixed, composition, 2k ±5%, 1/4w, Allen Bradley CB2025	5905-577-9454	.29	
R61	Not assigned			
R62	Resistor, fixed, composition, 120Ω ±5%, 1/4w, Allen Bradley CB1215	5905-577-9689	.29	
R63	Resistor, fixed, composition, 47Ω ±5%, 1/4w, Allen Bradley CB4705	5905-577-9945	.29	
R64	Resistor, fixed, composition, 1k ±5%, 1/4w, Allen Bradley CB1025	5905-577-9495	.29	
R65	Resistor, fixed, composition, 100k ±2%, 1/2w, Allen Bradley RL07Ad104G		.29	
R66	Resistor, fixed, composition, 1.5k ±5%, 1/4w, Allen Bradley CB1525	5905-577-9947	.29	
R67	Resistor, fixed, composition, 5.6 meg ±2%, 1/2w, Allen Bradley 5654			
S1	Switch, rotary, dpdt, DEI B32179		89.80	1
T1	Transformer, broadband, DEI B18263-2		58.76	1
T2A	Transformer, i-f primary, DEI B32175		68.44	1
T2B	Transformer, i-f secondary, DEI B32176		69.32	1

RF TUNING UNIT, Cont'd

Reference Designation		Federal Stock No.	Est. Unit Cost	Recom'd. Spares
T3A	Transformer, i-f primary, DEI B32177		$68.44	1
T3B	Transformer, i-f secondary, DEI B32136		69.80	1
V1	Tube, electron, nuvistor, RCA 8203		11.40	1
V2	Tube, electron, nuvistor, RCA 8058		19.88	1
V3	Tube, electron, nuvistor, RCA 7587	5960-852-5545 -CC	10.40	2
V4	Tube, electron, nuvistor, RCA 7587	5960-852-5545 -CC	10.40	2
W1	Cable assembly, rf tuning unit, DEI B32169		37.02	1
XV1	Socket, tube, nuvistor, solder type, Cinch 133-65-10-001	5935-885-9455	1.68	
XV2	Socket, tube, nuvistor, solder type, Cinch 133-65-10-001	5935-885-9455	1.68	
XV3	Socket, tube, nuvistor, solder type, Cinch 133-65-10-001	5935-885-9455	1.68	
XV4	Socket, tube, nuvistor, solder type, Cinch 133-65-10-001	5935-885-9455	1.68	

NOTE: The asterisk and number included in the estimated unit cost column denotes minimum buy requirements. For example, $.76*18 indicates a minimum buy of 18 units at $.76 each.

SECTION VIII
SCHEMATIC DIAGRAMS

8-1 INTRODUCTION

This section contains the schematic diagram of the Model RTH-B18 RF Tuning Unit. The schematic diagram provided in this section will be useful in gaining an understanding of the functional description presented in Section II, and as an aid in the maintenance, alignment, and operation of the rf tuning unit.

The component parts of the rf tuning unit, shown by symbols and referred to by reference designations, on the schematic diagram are listed in Section VII as repair parts.

No waveforms are included on the schematic diagram because the characteristics of a waveform at a specific test point depends on the characteristics of the signal being received at that particular interval of time. Therefore to present a waveform at a test point leads to unnecessary confusion and does not facilitate the maintenance of the rf tuning unit.

Unless otherwise noted the following information applies to the schematic diagram.

a. Capacitor values less than one are in microfarads.
b. Capacitor values greater than one are in picofarads (micromicrofarads).
c. Inductance values are in microhenrys.
d. Resistor values are in ohms, K=1000, M=1,000,000.
e. ⊘ Internal adjustment.
f. ⟆ Arrow denotes clockwise rotation.
g. ○ Operating control.
h. Partial reference designations are shown; for complete identification prefix with the unit number or subassembly designation.
i. * Typical value.

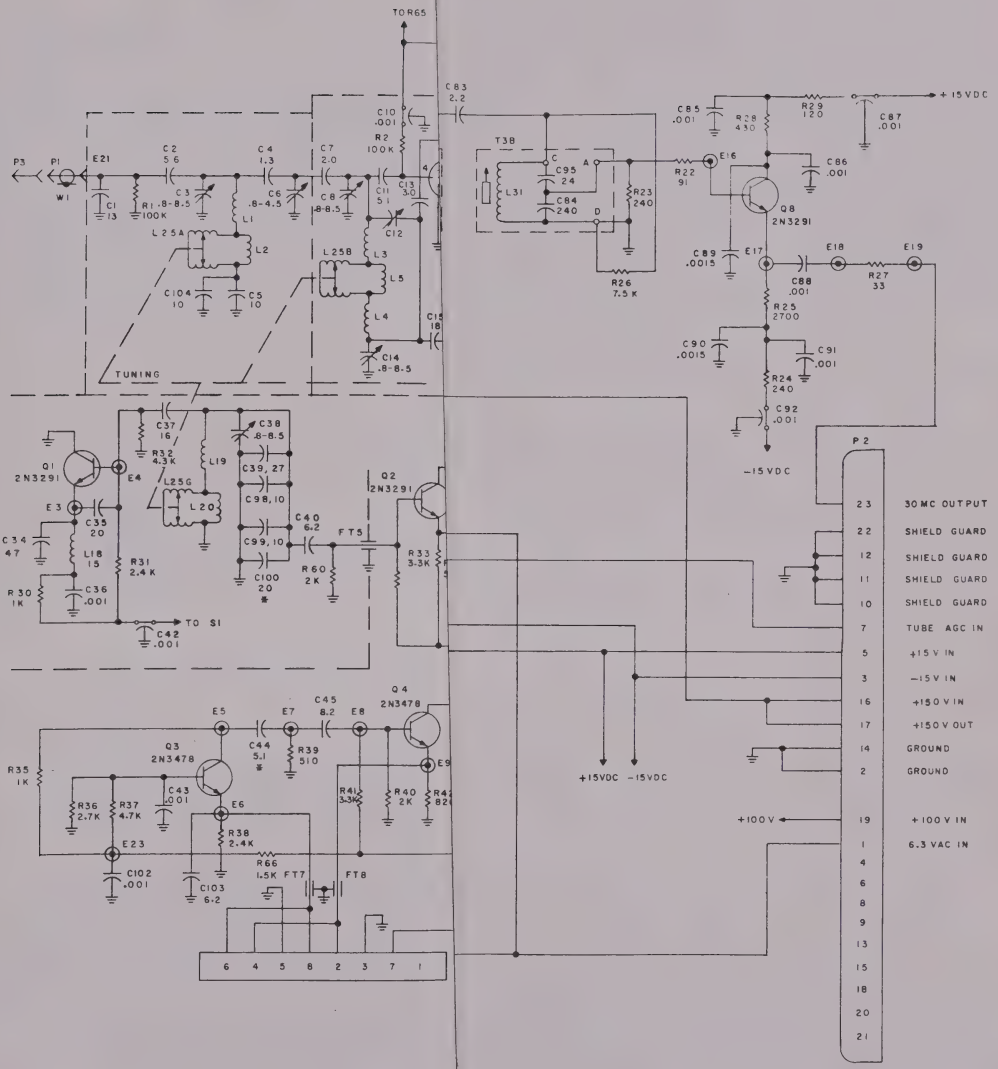


Figure 8-1. Model RTH-B18 RF Tuning Unit, Schematic Diagram R32224

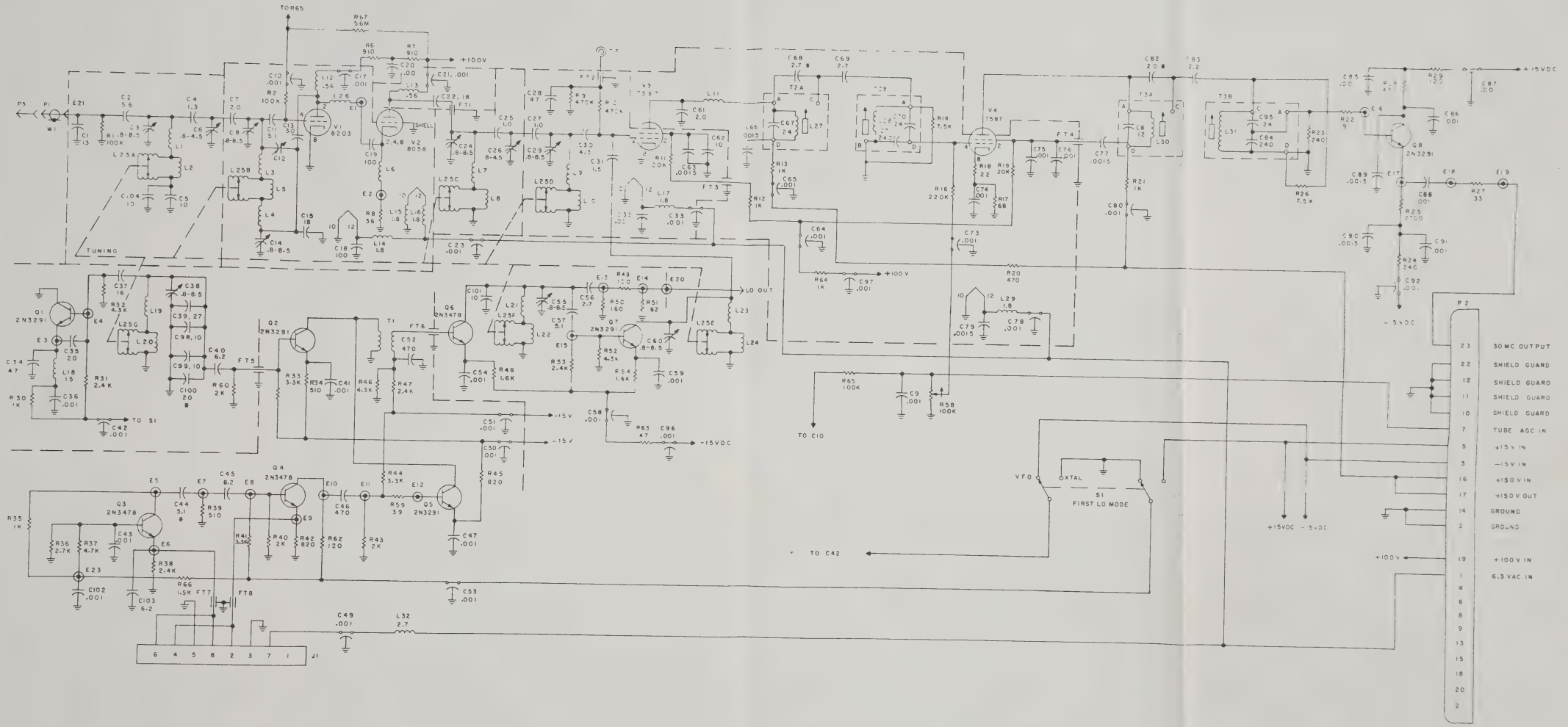


Figure 8-1. Model RTH-B18 RF Tuning Unit, Schematic Diagram , R32224

SECTION IX
MODEL RTH-B18B RF TUNING UNIT MODIFICATION

9.1 GENERAL

The Model RTH-B18B Tuning is essentially identical to the Model RTH-B18 Tuning Unit described in the preceding sections. The modification consists of retuning the unit to track over the range of 215 mc to 260 mc. The noise figure over this range is 8 db or less. The modification also provides the means for externally monitoring the local oscillator output frequency. The connector added for monitoring purposes is designated "P4 LO OUTPUT" and is located on the apron of the tuning unit. The following formula is provided to determine the frequency present at P4:

$$F_O = \frac{F_R + 30}{2}$$

F_O = output frequency
F_R = operating frequency

9.2 OPERATION

The Model RTH-B18B is operated in the identical manner as the RTH-B18. The operating procedures are found in Section III of this manual.

9.3 RANGE MAINTENANCE

Range maintenance for the RTH-18B is identical to that given in Section IV except for the local oscillator frequency check and the age level adjust. The procedures for checking the local oscillator frequency and adjusting the age level are found in paragraphs 9.3.1 and 9.3.2, respectively.

9.3.1 LOCAL OSCILLATOR FREQUENCY

For optimum performance of the rf tuning unit, the frequency of the local oscillator must be precisely 30 mc higher than the frequency to which the rf amplifier is adjusted. The following procedure is intended to ascertain that this relationship exists.

Recommended Equipment:

Electronic Counter	HP 5245L
Converter Unit	HP 5253B
Test Cable	DEI B32253

a. Place the POWER switch on the front panel of the TMR-18B receiver to the OFF position. Remove the rf tuning unit from the receiver by loosening the four knurled thumbscrews and sliding the unit out of the receiver.

b. Connect the tuning unit to the receiver using the DEI B32253 test cable. Connect the HP 5245L converter input to P4 on the tuning unit. Apply power to the receiver.

c. The counter should indicate frequencies of 122.5 mc, 132.5 mc, and 145 mc for dial settings of 215 mc, 235 mc, and 260 mc, respectively. The allowable tuning dial error is ±1%.

9.3.2 GAIN STANDARDIZATION

This adjustment sets the output level of the tuning unit to 50 mv when the input signal is at 0 dbm. The gain of the tuning unit is -13 db when an age level of -8 volts is applied.

The procedures for making this adjustment are found in paragraph 9.4.2.6.

9.4 BASE MAINTENANCE

The base maintenance for the RTH-B18 is identical to that given in Section V of this manual except for the initial test setup and the alignment procedures. The procedures for the initial test setup and for aligning the unit are given in paragraphs 9.4.1 and 9.4.2, respectively.

9.4.1 INITIAL TEST SETUP

Remove the tuning from the receiver main chassis. Install the DEI B32253 test cable between the receiver and the tuning unit. Set the controls to the following positions:

a. FIRST LO MODE switch to the XTAL position

b. SECOND LO MODE switch to the XTAL position

c. POWER switch to the OFF position

d. AGC NORMAL/OFF switch to the OFF position

9.4.2 ALIGNMENT PROCEDURES

Recommended Equipment:

Signal Generator	HP 606A
Signal Generator	HP 608D
Oscilloscope	HP 130C
RF Millivoltmeter	HP 411A
RF Probe Kit	HP 11027A
Vacuum Tube Voltmeter	HP 412A
Power Supply	HP 721A
Electronic Counter	HP 5245L
Electronic Converter	HP 5253B

Recommended Equipment, cont'd

VTVM	HP 400D
Noise Figure Meter	HP H18-340B
Noise Diode	HP 343A
Sweep Generator	Jerrold 900B
Sweep Generator	RCA WR-59C
VTVM	RCA WV-98C
Noise Figure Amplifier	DEI LM 22503
FM Generator	Boonton 202J
Attenuator	Jerrold AV-50
Power Divider	Adams-Russell TU-50
Spectrum Display Unit	DEI SA-102 or TDU-4
Receiver	DEI TMR-18B
Crystal	CR-52A/U 40.83333 mc
Crystal	CR-52A/U 44.33333 mc
Crystal	CR-52A/U 48.33333 mc
Test Fixture, RF Tuning Unit, Cable	DEI B32253
Test Fixture, RF Tuning Unit, Bottom Cover	DEI C32285
Test Fixture, RF Tuning Unit, IF Partial Cover	DEI C32286
Alignment Fixture, 91 ohms	DEI C17248
Alignment Fixture, Detector 50 ohms	DEI C17208

9.4.2.1 FIRST IF AMPLIFIER

a. Remove the bottom cover and install the i-f partial cover (be sure to install all screws). Connect the rf tuning unit cable and place the switch in the OFF position. Set the FIRST LO MODE switch to the XTAL position.

b. Set the HP 606A signal generator to 30 mc at an output level of 30 millivolts. Connect the signal generator to the DEI C17208 50 ohm detector input. Connect the detector output to the HP-130C oscilloscope and adjust the sensitivity for full scale deflection (10 centimeters when DC coupled). Disconnect and connect the detector to check for 10 centimeters of deflection. Maintain this oscilloscope sensitivity throughout the i-f alignment. Disconnect the detector from the generator.

c. Connect the detector input to A1P2.

d. Remove the lead connected to pin D of T2B. Connect the 91 ohm termination between pin 4 of V4 and ground. Connect the RCA WR-59C sweep generator to the termination. Apply power to the receiver.

e. Set the sweep generator output for a convenient level and adjust T3A and T3B for response centered at 30 mc and symmetrical about the 1.5 db points, (70% response points on the oscilloscope display).

f. Disconnect the test equipment. Solder the lead to pin D of T2B. Remove the i-f partial cover.

g. Tack solder a 220 uuf capacitor (Erie HP-839-X5F) to pin 4 of V3. Install the bottom cover C32285 and all screws. Connect the WR-59C sweep generator between the 220 uuf capacitor and ground.

h. Set the output of the sweep generator as necessary to maintain a full scale deflection. Adjust T2A and T2B for a response centered at 30 mc and symmetrical about the 3 db points (the 3 db points are the 50% point on the oscilloscope response). The 3 db bandwidth should be 1.0 mc ±5% and the peak-to-valley ratio should be 1.10 as observed on the oscilloscope.

NOTE

When properly tuned T2B will rock
the response about the center frequency.

i. Remove the test equipment and unsolder the 220 uuf capacitor.

9.4.2.2 XTAL OSCILLATOR AND BUFFER AMPLIFIER

a. Remove the test bottom cover from the tuning unit. Insert the 40.83333 mc crystal into the front panel crystal socket. Set T1 to the mechanical center of its range.

b. Using the clip on probe, connect the HP 411A to the collector of Q5 (top of T1) the voltage should be approximately 1v.

c. Connect the HP 5245L counter to the collector of Q5 (top of T1) using a UG-1094/U connector at the end of a 3 foot piece of RG-62/U. Check that the frequency indicated on the counter is that of the crystal.

d. Repeat steps a, b, and c for crystal frequencies of 44.33333 mc and 48.33333 mc.

e. Replace the test bottom cover (DEI C32285). Connect the counter to A1E20. Connect the RCA WV-98C to FT2.

f. Set the tuning dial on the RTH-B18B to 215 mc and install the 40.83333 mc crystal. Adjust C55 for maximum output as indicated by the signal level meter on the counter. Adjust C60 for maximum indication on the vtvm.

g. Set the tuning dial to 260 mc and install the 48.33333 mc crystal. Adjust L21 for maximum output as indicated by the signal level meter on the counter. Adjust L23 for maximum output as indicated on the vtvm.

h. Repeat steps f and g until no further adjustment is necessary.

i. Set the FIRST LO MODE switch to the VFO position and remove the crystal.

j. Set the dial to 235.00 mc and adjust C38 for a frequency of 132.500 mc as indicated by the counter.

k. Set the dial to 260.0 mc and adjust L19 for a frequency of 145.00 mc as indicated by the counter.

l. Set the dial to 215.0 mc and adjust L20 for a frequency of 122.5 mc as indicated by the counter.

m. Repeat steps j, k, and l until the dial reads within 25 kc at the three tracking points 215, 235, and 260 mc.

n. Disconnect all equipment.

9.4.2.3 RF INTERSTAGE

a. Disconnect L26 from E1. Connect a UG-1094/U connector, with no lead, between E1 and ground on the test cover.

b. Connect a 40 db pad between the 30 mc i-f output on the tuning unit and the 30 mc input jack on the second i-f amplifier.

c. Connect the vertical input of the oscilloscope between FT2 and ground using a maximum of 3 ft. of RG-62/U cable. Connect the a-m output, of the receiver, A4TP1, to the Z axis input of the oscilloscope. Set the oscilloscope for a 50 mv/cm sensitivity AC coupled.

d. Connect the rf output of the Jerrold 900B sweep generator to the UG-1094/U connector installed in step a. Set the sweep generator attenuator to the 10 db range.

e. Set the receiver to 235 mc. Adjust the frequency of the sweep generator for a convenient oscilloscope display. Adjust the blanking marker for a convenient width by adjusting R11 on the receiver main chassis.

f. Adjust C24, C26, and C29 for maximum pattern amplitude at the blanking marker (235 mc).

g. Check the bandwidth by connecting the output of the HP 608D signal generator to ground near the first hole above the input tuned circuits. Set the HP 608D to exactly 233 mc. Set the output for a convenient marker level.

h. Adjust the oscilloscope for a full scale deflection (10 centimeters). Adjust the frequency of the tuning unit to place the marker at the 70% point on the response curve. If necessary, readjust the main tuning control on the sweep generator to reposition the response. Set the HP 608D to exactly 237 mc and observe the marker is at the 70% response point on the oscilloscope.

i. If the bandwidth is not 4 mc at the 70% points then C26 which controls the bandwidth should be readjusted. After an adjustment is made of C26, then C24, and C29 should be readjusted for proper shape. Recheck the bandwidth. Repeat until the 70% points are 4 mc apart.

j. Set the dial to 260 mc and adjust L7, in the primary, and L9, in the secondary, for maximum amplitude at the blanking marker.

k. Set the dial to 215 mc and adjust L8, in the primary, and L10, in the secondary, for maximum amplitude at the blanking marker.

l. Set the dial to 235 mc and adjust C24 and C29 for maximum amplitude at the blanking marker.

m. Repeat steps g, h, i, j, k, and l until no further adjustments of L or C is necessary.

NOTE

When making the adjustments of L and C, if they are slightly over-adjusted, proper tracking will be achieved more rapidly.

n. Disconnect the test equipment. Unsolder the UG-1094/U connector from E1. Resolder L26 to E1.

9.4.2.4 FINAL VFO AND MULTIPLIER ALIGNMENT

a. Connect the counter to E20. Connect the WV-98C to FT2.

b. Set the tuning dial to 235.0 mc and adjust C38 for a frequency of 132.5 mc.

c. Set the tuning dial to 260.0 mc and adjust L19 for a frequency of 145.00 mc.

d. Set the tuning dial to 215.0 mc and adjust L20 for a frequency of 122.5 mc.

e. Repeat steps b, c, and d until no further adjustments of C or L are required and the oscillator frequency is within 25 kc at the three tracking points of 215, 235 and 260 mc.

f. Set the tuning dial to 235 mc and adjust C55 for maximum output as indicated by the signal level meter on the counter. Adjust C60 for maximum output as indicated on the vtvm.

g. Set the tuning dial to 260 mc and adjust L21 for maximum output as indicated by the signal level meter on the counter. Adjust L23 for maximum output as indicated on the vtvm.

h. Set the tuning dial to 215 mc and adjust L22 for maximum output as indicated by the signal level meter on the counter. Adjust L24 for maximum output as indicated on the vtvm.

i. Repeat steps f, g, and h until no further adjustments of L and C are required.

j. Disconnect all test equipment.

9.4.2.5 RF INPUT STAGE ALIGNMENT

a. Connect the Jerrold 900B sweep generator to P3. Connect the oscilloscope to FT2. Connect a HP 721A power supply between C9 and ground. Set the switch on the rf jumper cable to the OFF position. Set the agc switch on the rear apron to the OFF position.

b. Set the voltage at C9 to -4v ±5%. Set the sweep generator attenuator to the 10 db position. Set C14 to approximately mid-range.

c. Set the frequency of the tuning unit to 235 mc. Set the frequency of the sweep generator to that of the tuning unit. Adjust the oscilloscope gain for approximately one-half scale deflection on the 20 mv/cm range.

d. Adjust C3, C6, and C8, for maximum amplitude at the blanking marker. Increase the voltage at C9 to -15 volts. Increase the sensitivity of the scope for the best pattern and adjust C14 for minimum scope deflection. Reset the voltage at C9 to -4v, reset the oscilloscope sensitivity and adjust C8 for proper response.

e. Measure the bandwidth at 235 mc and at the 90% points. Connect the HP 608D to the bottom cover, connect the lead to the cutout over the input stage.

f. Increase the oscilloscope sensitivity for a full scale deflection of ten centimeters. Set the frequency of the HP 608D to 234 mc with output level that produces a small marker on the response curve.

g. Adjust the frequency of the tuning unit to set the marker at the 90% point on the response curve, readjusting the oscilloscope gain to maintain full scale deflection.

h. Set the frequency of the HP 608D to 236 mc, the marker should be at the opposite 90% point. If the bandwidth is not correct, make an adjustment of C6. An increase in the capacity of C6 will decrease the bandwidth, thus if the capacity is decreased, the bandwidth will increase.

i. Readjust C3 and C8 for the proper shape, and maximum amplitude at the blanking marker. Proper tuning is when the primary, C3, rocks the response curve about the blanking marker.

j. Increase the voltage at C9 to -15v. Increase the sensitivity of the oscilloscope to obtain the best pattern. Adjust C14 for a minimum oscilloscope deflection. Reset the voltage at C9 to -4 volts and reset the oscilloscope sensitivity to the 20 mv/cm position. Readjust C8, if necessary, for proper shape.

k. Repeat step e, f, g, h, i, and j until the bandwidth is 2 mc at the 90% points and the primary C3 rocks the response about the blanking marker.

l. Set the tuning unit to 260 mc. Adjust the primary, L1, and the secondary, C12, for maximum amplitude at the blanking marker.

m. Set the tuning unit to 215 mc. Adjust the primary shunt inductor, L2, and the secondary shunt inductor, L5, for maximum amplitude at the blanking marker.

n. Set the tuning unit to 235 mc. Adjust C3 and C8 for proper shape.

o. Repeat steps e through n until no further adjustment is necessary and the primary, C3, will rock the response at the three tracking points of 215, 235 and 260 mc.

NOTE

If proper interstage tuning and tracking has not been obtained, it will be impossible to achieve proper overall tuning.

p. Remove all test equipment.

q. Connect the RCA WV-98C vtvm between FT2 and ground.

r. Tune the tuning unit from 215 to 260 mc and observe the reading on the vtvm. It should be between .55 and .9vdc.

9.4.2.6 NOISE FIGURE. This adjustment and measurement is made to properly adjust L26 for minimum noise figure.

a. Connect A1P2, the 30 mc i-f output from the tuning unit, to the input of the noise figure amplifier LM 22503. Connect the output of the noise figure amplifier to the input on the HP H18-340 noise figure meter.

b. Connect the HP 343A noise diode to the rf input, J1.

c. Tune the tuning unit from 215 to 260 mc and observe the noise figure, it should be 8 db or less across the band.

d. If the noise figure is greater than 8 db, adjust L26 for minimum noise figure across the band.

e. Disconnect all equipment.

9.4.2.6 GAIN STANDARDIZATION

a. Place the agc switch, on the rear of the receiver, to the NORMAL position. Place the switch on the jumper cable to the ON position. Set the tuning dial to 235 mc. Connect A1P2 to A2J1. Connect the HP 608D to the rf input, P1.

b. Set the signal generator to an output level of 1 millivolt and tune the signal generator to the receiver by observing the receiver tuning meter.

c. Disconnect A1P2 from A2J1 and connect the HP 411A to A1P2, the 30 mc i-f output from the tuning unit. Place the switch on the rf jumper cable to the OFF position. Connect an HP 721A power supply between C9 and ground. Set R58 fully counterclockwise and R61 fully clockwise.

d. Set the power supply for zero volts at C9. Adjust the attenuator on the HP 608D to produce 0 db on the .03 volt range of the HP 411A. Note this reading.

e. Set the voltage at C9 to -8v, as measured with the HP 412A. Increase the HP 608D to produce 0 db on the .03 volt range of the HP 411A. Note this reading.

f. The difference between the reading obtained in step d and the reading in step e should be at least 45 db.

g. Set the voltage at C9 to -8v, as measured with the HP 412A. Adjust R61 to give a 40 db gain reduction, as read on the HP 411A.

h. Set the attenuator on the HP 608D to 0 dbm.

i. Adjust R58 to set output of the tuning unit to 50 millivolts, as indicated by the the HP 411A.

j. Disconnect all test equipment.

9.5 ELECTRICAL PARTS LIST

The electrical parts list for the Model RTH-B18B is identical to that given in Section VII with the following changes:

C93	Capacitor, feed-thru, 0.001 uf, GMV, Allen Bradley FA5C-102W
CR21	Diode, 1N483
P2	Receptacle, miniature, Amphenol 57-10240
P4	Connector, BNC to Push-on, DEI A18269
R61	Resistor, variable, composition, 2.5k, RV6LAYSA252A
R65	Resistor, fixed composition, 10k ±5%, 1/2w, Allen Bradley EB1035
R67	Resistor, fixed composition, 1.2k ±5%, 1/2w, Allen Bradley EB1225
W2	Cable assembly, rf tuning, DEI B33863

9.6 SCHEMATIC DIAGRAM

The schematic diagram for the RTH-B18B is identical to that shown in figure 8-1 with the changes shown in figures 1 and 2.

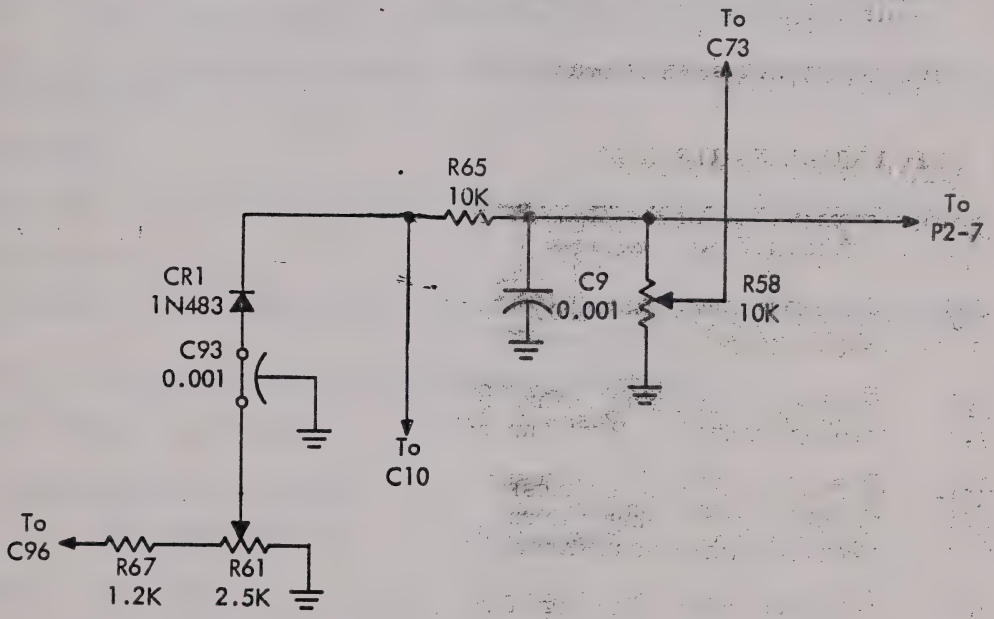


Figure 1

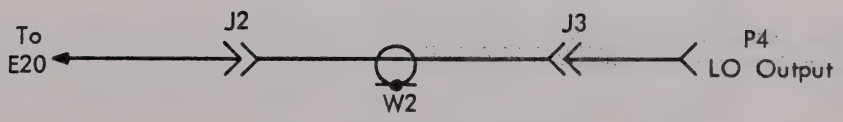


Figure 2

ADDENDUM

The Model RTH-F18B RF Tuning Unit is a modified version of the Model RTH-F18 RF Tuning Unit. The modification provides facilities for externally monitoring the local oscillator output frequency and output voltage level. The connector added for monitoring purposes is designated P14 LO OUTPUT.

The following information applies to and supersedes information given in this instruction manual:

SECTION IV

Paragraph 4.2.1.1, step c, line 2; change to read: P14 on the tuning unit.

SECTION V

Paragraph 5.6.4.1, step a, line 1, second sentence; change to read: Connect the counter to P14.

Add the following paragraph to the alignment procedure:

5.6.9 FIRST LO OUTPUT

Recommended Equipment:

RF Millivoltmeter HP 411A

5.6.9.1 PROCEDURE

a. Connect the HP 411A, terminated in 50-ohms, to J10 on the rear apron of the receiver main chassis. Tune the receiver over the entire tuning range and observe that the HP 411A indicates a minimum level of 50 mv. If a level of less than 50 mv is observed, continue with this procedure.

b. Remove the power from the TMR-18B. Remove the tuning unit from the receiver main chassis. Remove the tuning unit bottom cover.

c. Bend inductor L11, slightly, towards C31. Replace the bottom cover and insert the tuning unit into the receiver main chassis. Apply power to the receiver and repeat step a.

d. Repeat steps a, b, and c until the HP 411A indicates a level of greater than 50 mv over the entire tuning range.

ADDENDUM

SECTION VII

Add the following components to the electrical parts list for the tuning unit main chassis:

P9 Plug, integral part of W4

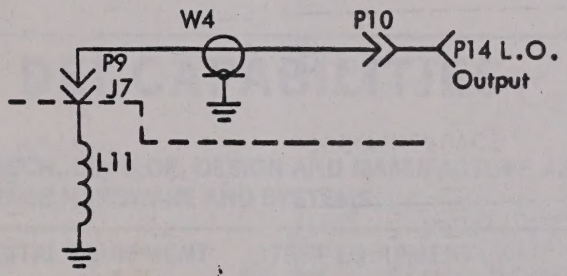
P10 Plug, integral part of W4

P14 Plug, push-on to BNC, DAGE 30584-1

W4 Cable, coaxial, DEI B34021

Section VIII

Add the following to the schematic diagram shown in figure 8-1.



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- FM Reference Oscillators

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